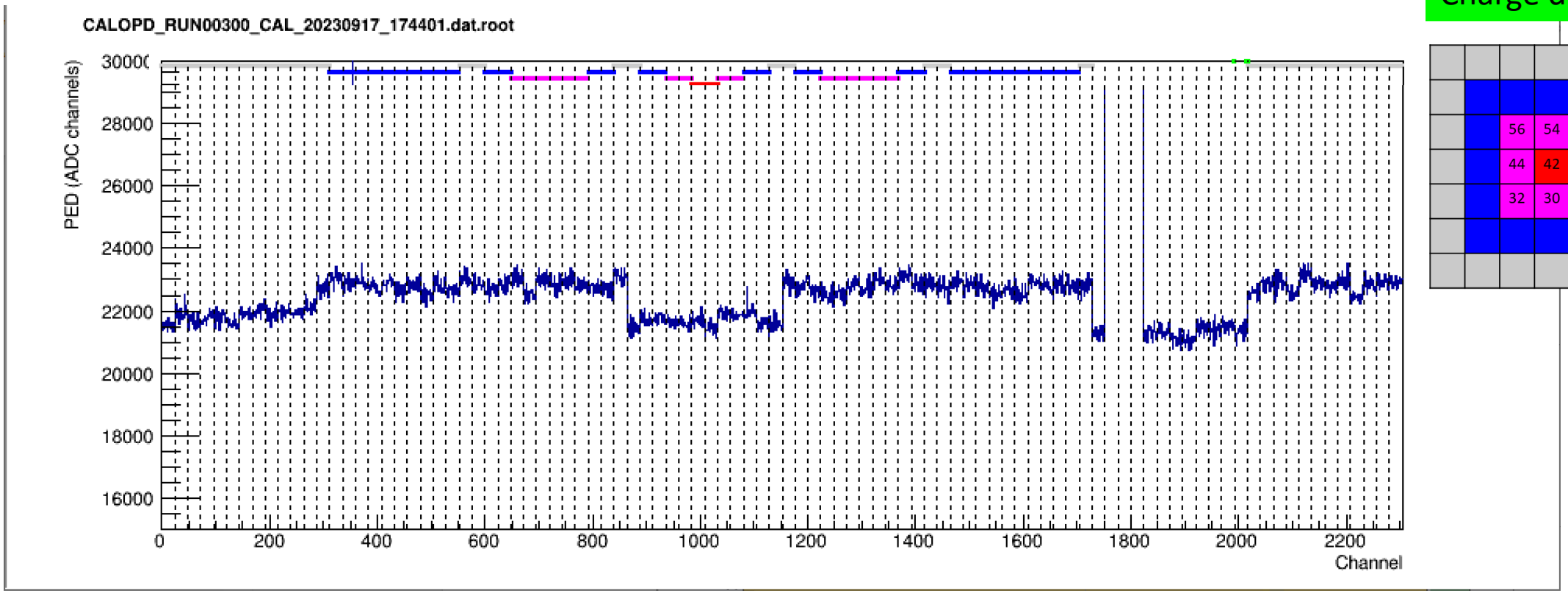
PS/SPS 2023

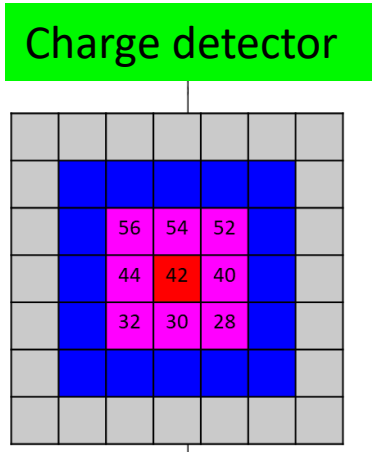
Elettroni

- Ricalibrati utilizzando calibrazione esterna (file CAL o OSCAL)
  - Verificato il metodo di sottrazione del CN → ok fit
- Check dell'effetto di pedestal shift, utilizzando eventi di calibrazione off-spill (file MIX)
  - Effetto ~% → correzione media per ogni file (in corso d'opera…)
- Check di rilasci anomali in prossimita` del cambio di guadagno
  - Particelle che attraversano l'intercapedine e colpiscono i sensori

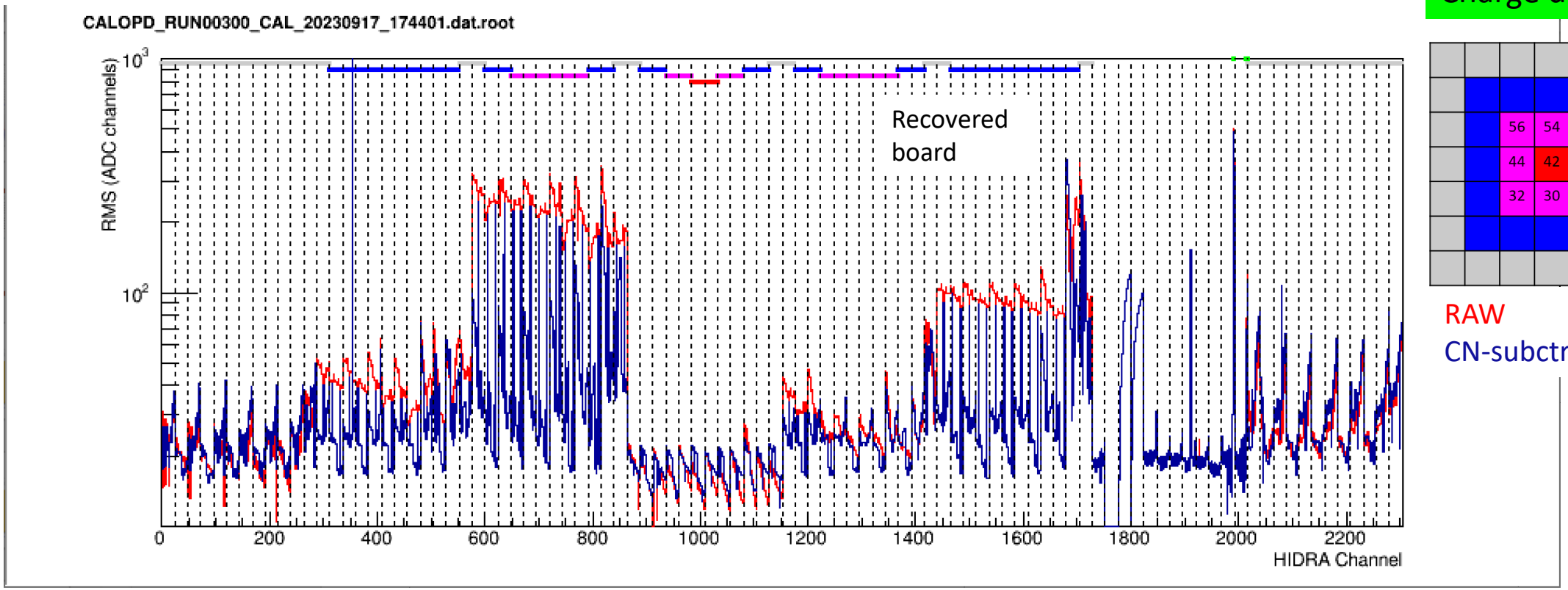
Energy (GeV)	Run	#Pulser	#Trigger	CAL
20	313	20730	100870	300
	333	17361	50152	371
50	~~176~~	~~322~~	~~0~~	
	~~177~~	~~0~~		
	304	1977	101296	300
~~80~~	~~360~~	~~0~~		
100	312	16875	100578	300
149	~~175~~	~~332~~	~~0~~	
	200	174	5753	204
	203	904	24334	204
	303	1576	100685	300
~~178~~	~~361~~	~~0~~		
197	~~182~~	~~0~~		
	305	317	18893	300
	~~306~~	~~0~~		
	307	1138	6924	300
	308	377	1714	300
	309	547	2734	300
	310	10150	47073	300
	311	17554	80840	300
200	334	728	51064	371
243	~~173~~	~~599~~	~~3~~	
	~~174~~	~~342~~	~~2~~	
	199	1354	40981	204
	301	170	9421	300
	302	2317	134038	300

PED

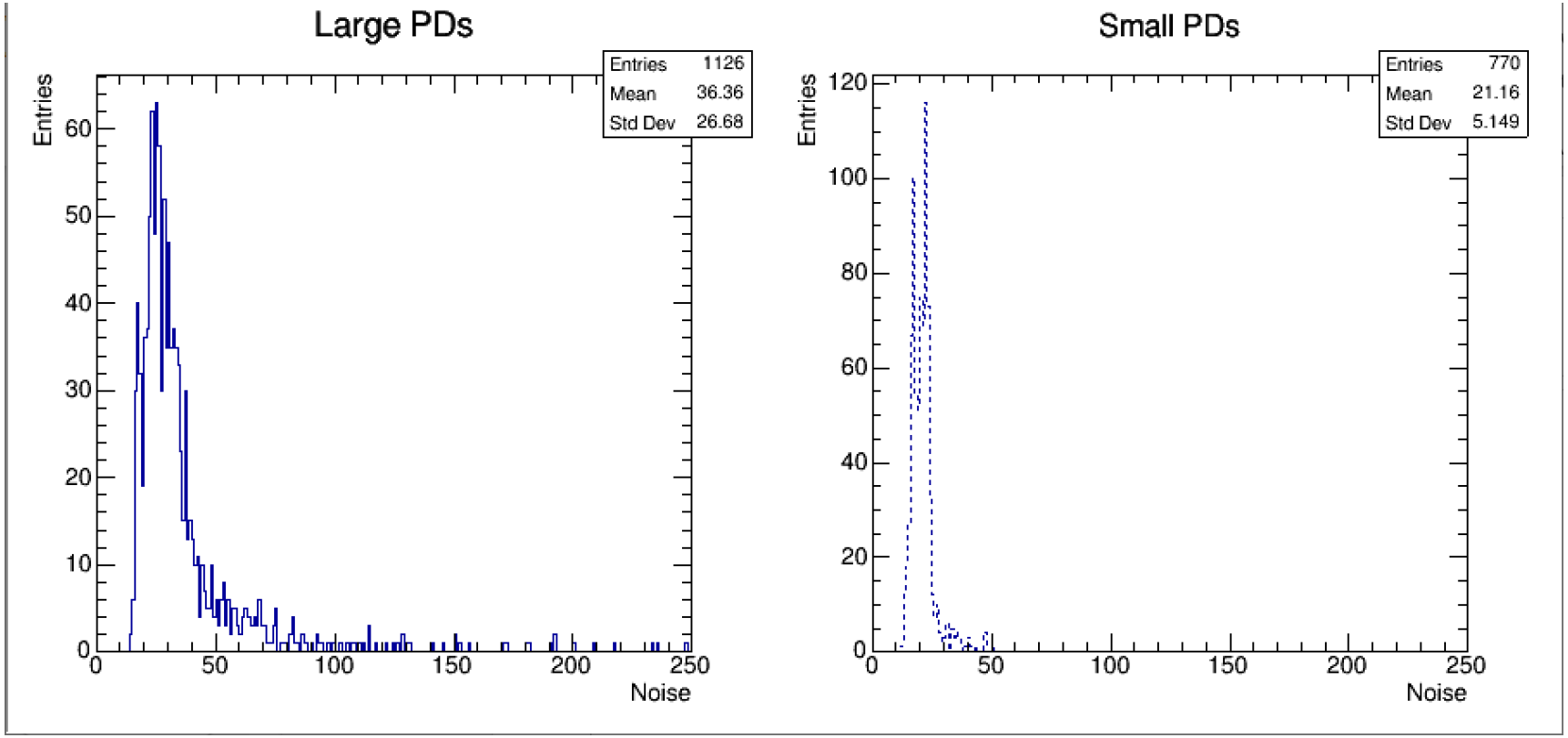

CALOPD_RUN00300_CAL_20230917_174401.dat.root
PED (ADC channels)
30000
28000
26000
24000
22000
20000
18000
16000
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
Channel


Charge detector
56
54
52
44
42
40
32
30
28

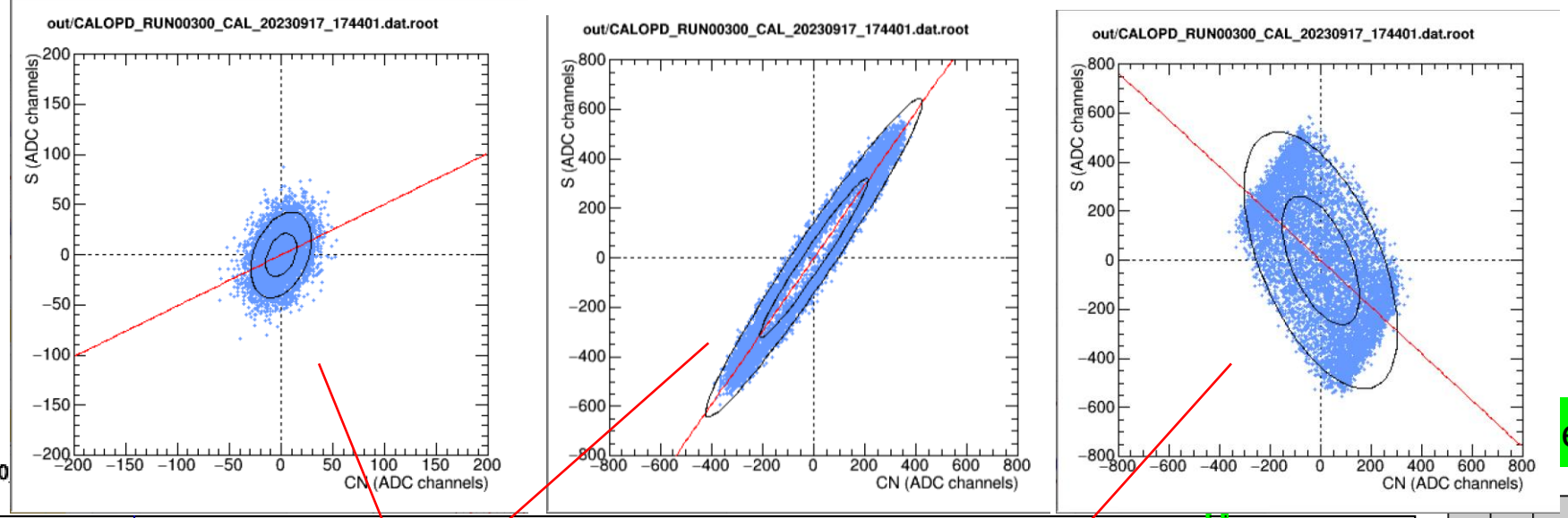
SIG

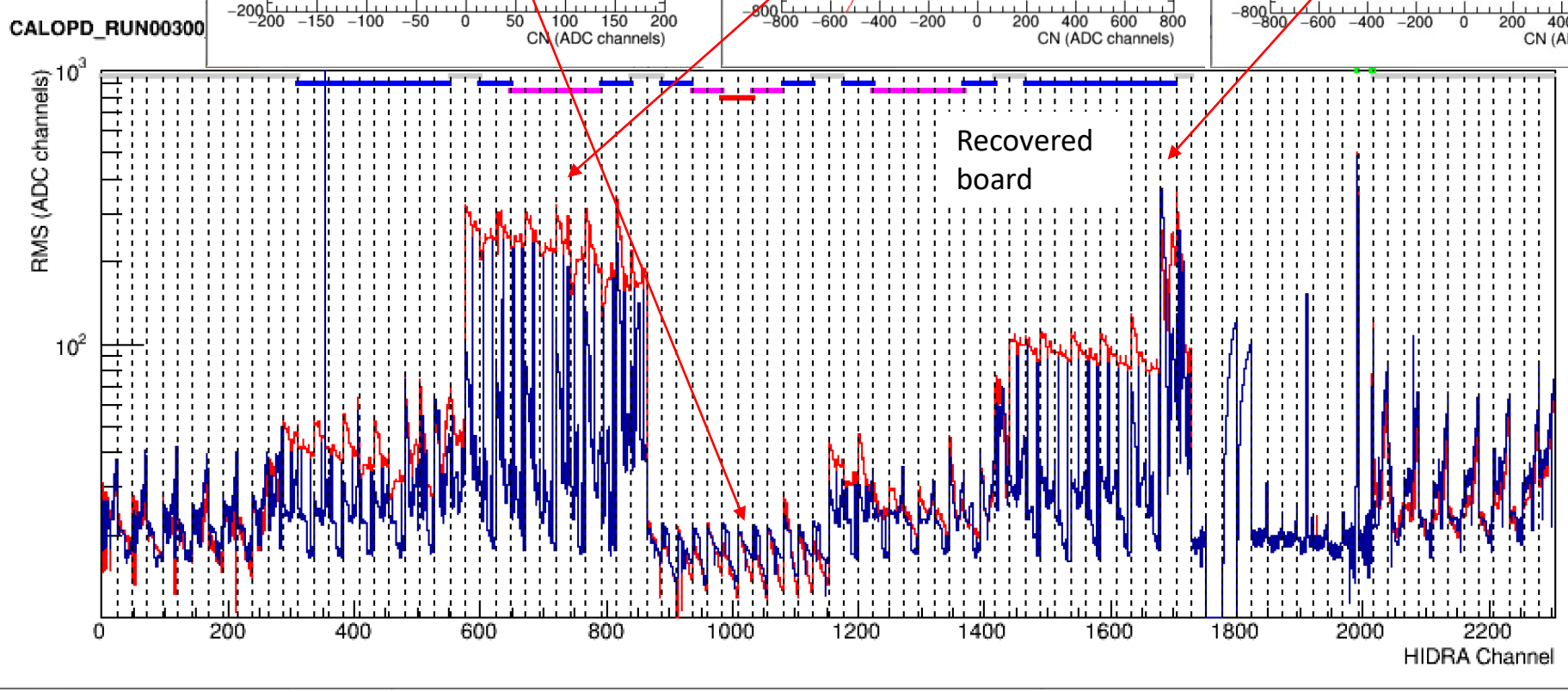

CALOPD_RUN00300_CAL_20230917_174401.dat.root
RMS (ADC channels)
10^3
10^2
Recovered board
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
HIDRA Channel
Charge detector
56
54
52
44
42
40
32
30
28
RAW
CN-subctracted

SIG

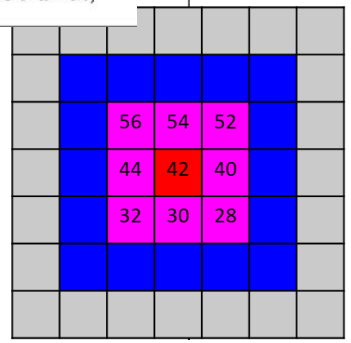

Large PDs
Entries 1126
Mean 36.36
Std Dev 26.68
Entries
Noise
Small PDs
Entries 770
Mean 21.16
Std Dev 5.149
Entries
Noise

SIG



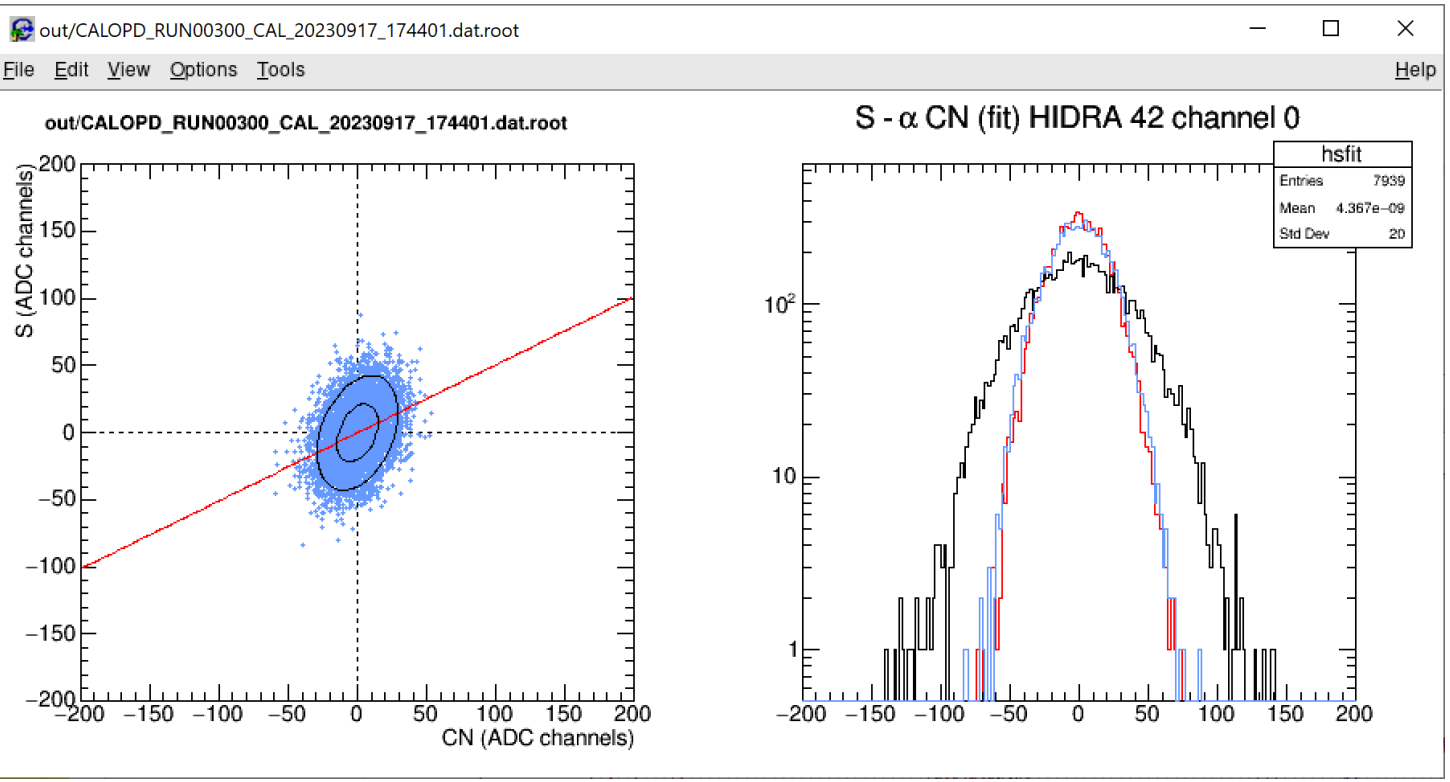


e detector



RAW

CN-subctracted



alpha (fit) 0.507447

eigenvalue 0 498.253 sqrt 22.3216

eigenvalue 1 173.492 sqrt 13.1716

R00 cos(theta) 0.362315 R01 -sin(theta) -0.932056

R10 sin(theta) 0.932056 R11 cos(theta) 0.362315

tg(theta) 2.5725

alpha (matrix) 2.5725

sigma(y) 21.3453

sigma(y - alpha*x) 36.354

RMS(y) 21.3453

RMS(y - alpha*x) fit 19.9992

RMS(y - alpha*x) matrix 36.354

mean(y - alpha*x) fit 4.36745e-09

mean(y - alpha*x) matrix 1.62746e-08

alpha (fit) 1.47991

eigenvalue 0 146547 sqrt 382.815

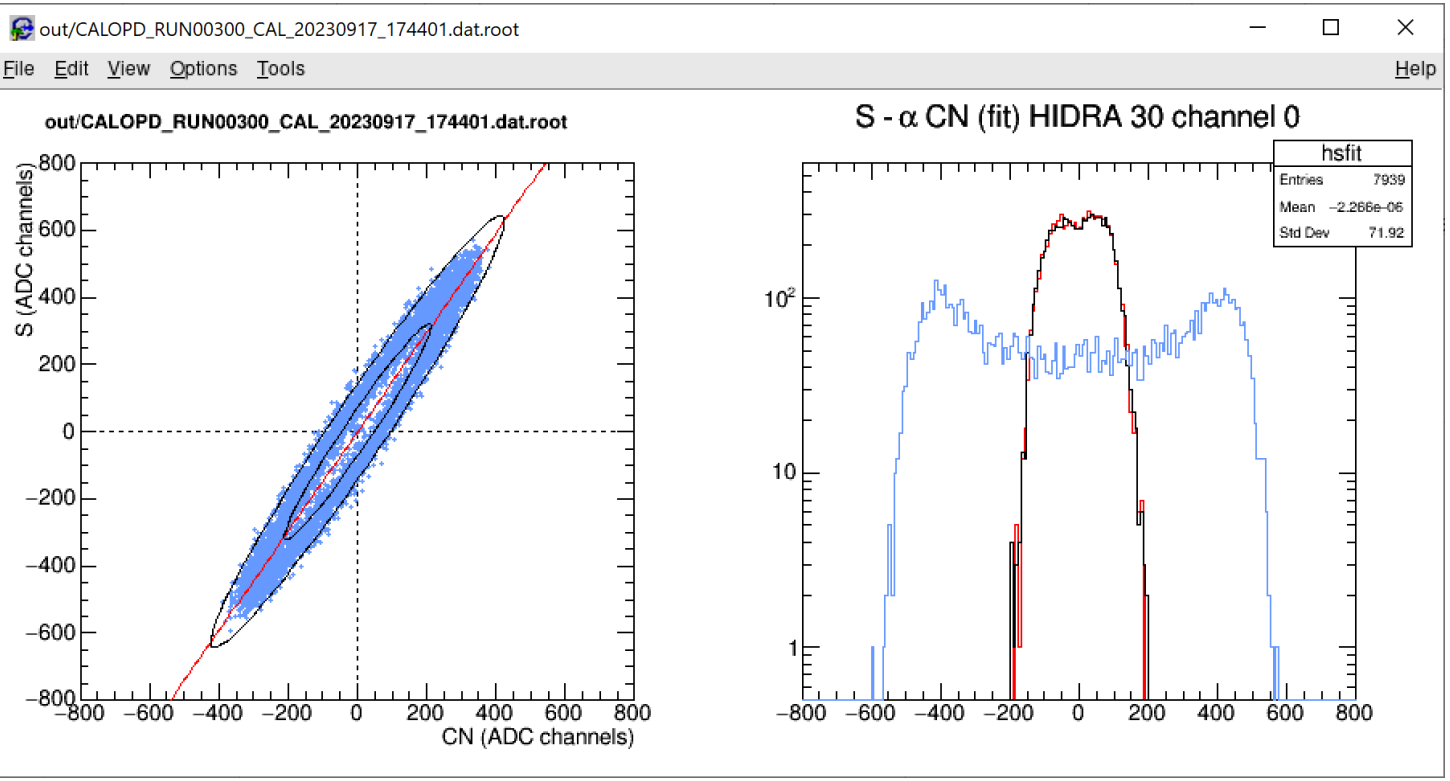
eigenvalue 1 1581.46 sqrt 39.7676

R00 cos(theta) 0.546089 R01 -sin(theta) -0.837727

R10 sin(theta) 0.837727 R11 cos(theta) 0.546089

tg(theta) 1.53405

alpha (matrix) 1.53405



sigma(y) 321.429

sigma(y - alpha*x) 72.8226

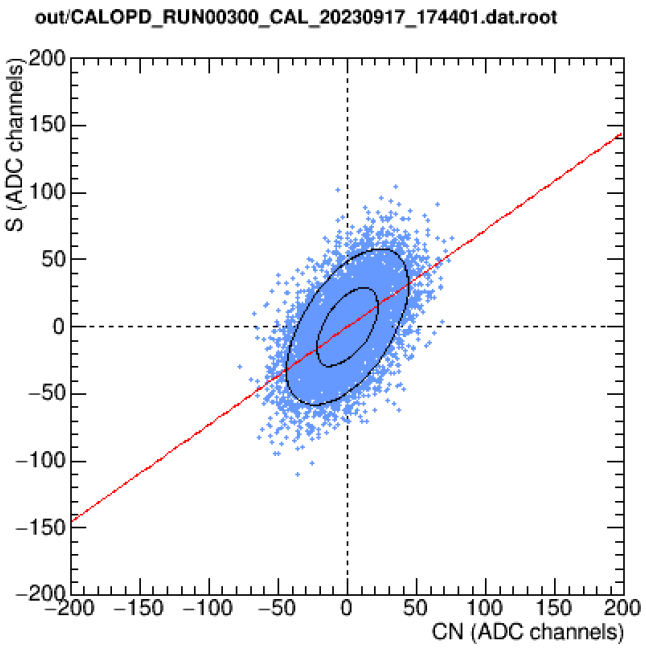
RMS(y) 321.429

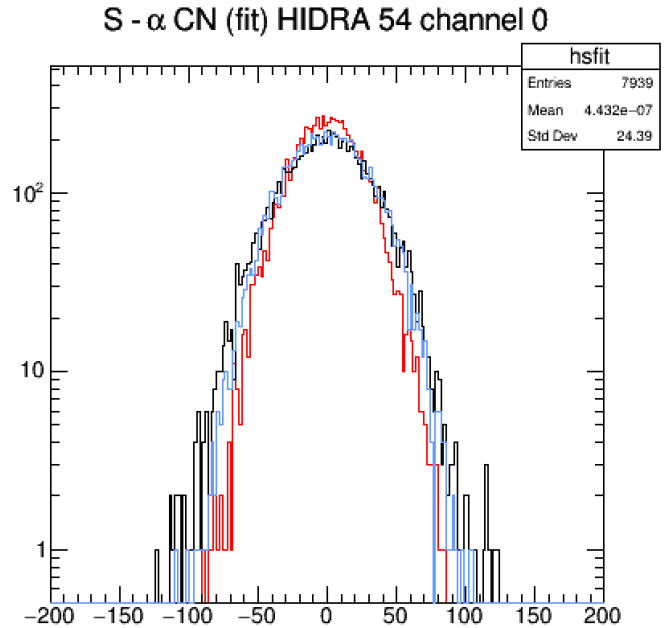
RMS(y - alpha*x) fit 71.9151

RMS(y - alpha*x) matrix 72.8226

mean(y - alpha*x) fit -2.26558e-06

mean(y - alpha*x) matrix -2.04245e-06





alpha (fit) 0.727834

eigenvalue 0 1063.2 sqrt 32.6068

eigenvalue 1 270.087 sqrt 16.4343

R00 cos(theta) 0.517694 R01 -sin(theta) -0.855566

R10 sin(theta) 0.855566 R11 cos(theta) 0.517694

tg(theta) 1.65265

alpha (matrix) 1.65265

sigma(y) 29.1658

sigma(y - alpha*x) 31.7453

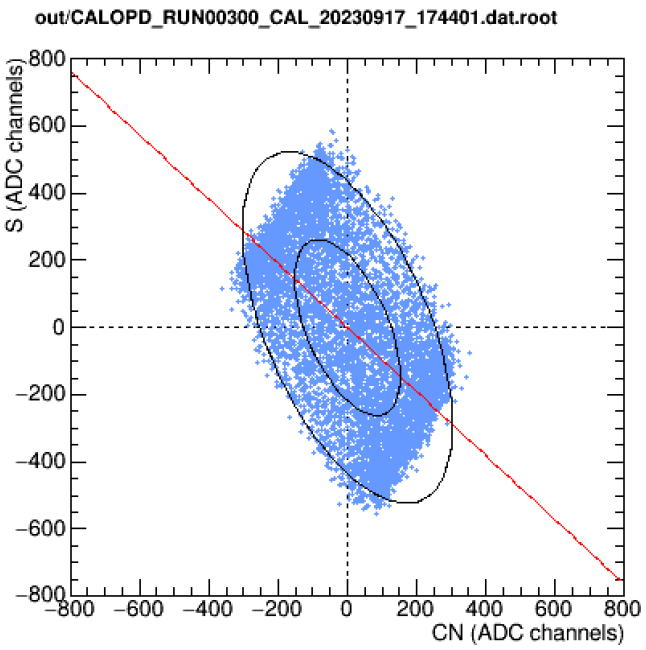
RMS(y) 29.1658

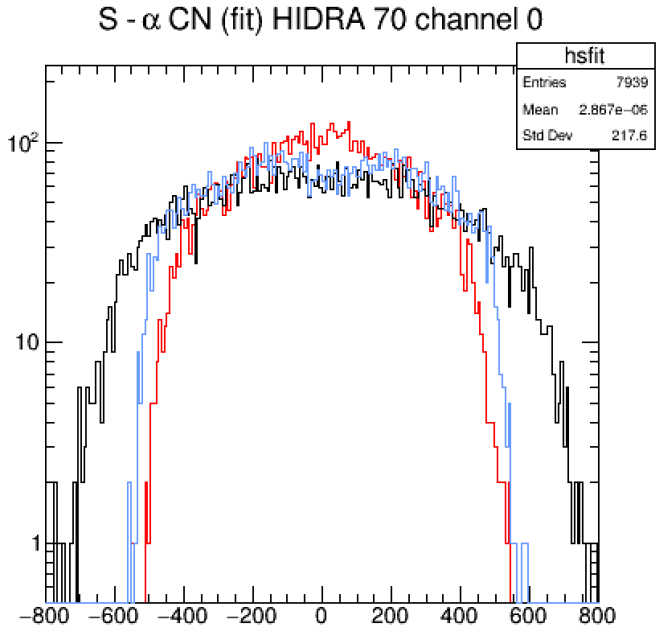
RMS(y - alpha*x) fit 24.3918

RMS(y - alpha*x) matrix 31.7453

mean(y - alpha*x) fit 4.43202e-07

mean(y - alpha*x) matrix 5.87623e-07





alpha (fit) -0.955149

eigenvalue 0 77335.7 sqrt 278.093

eigenvalue 1 14121.9 sqrt 118.836

R00 cos(theta) -0.376109 R01 -sin(theta) -0.926575

R10 sin(theta) 0.926575 R11 cos(theta) -0.376109

tg(theta) -2.46358

alpha (matrix) -2.46358

sigma(y) 261.522

sigma(y - alpha*x) 315.961

RMS(y) 261.522

RMS(y - alpha*x) fit 217.605

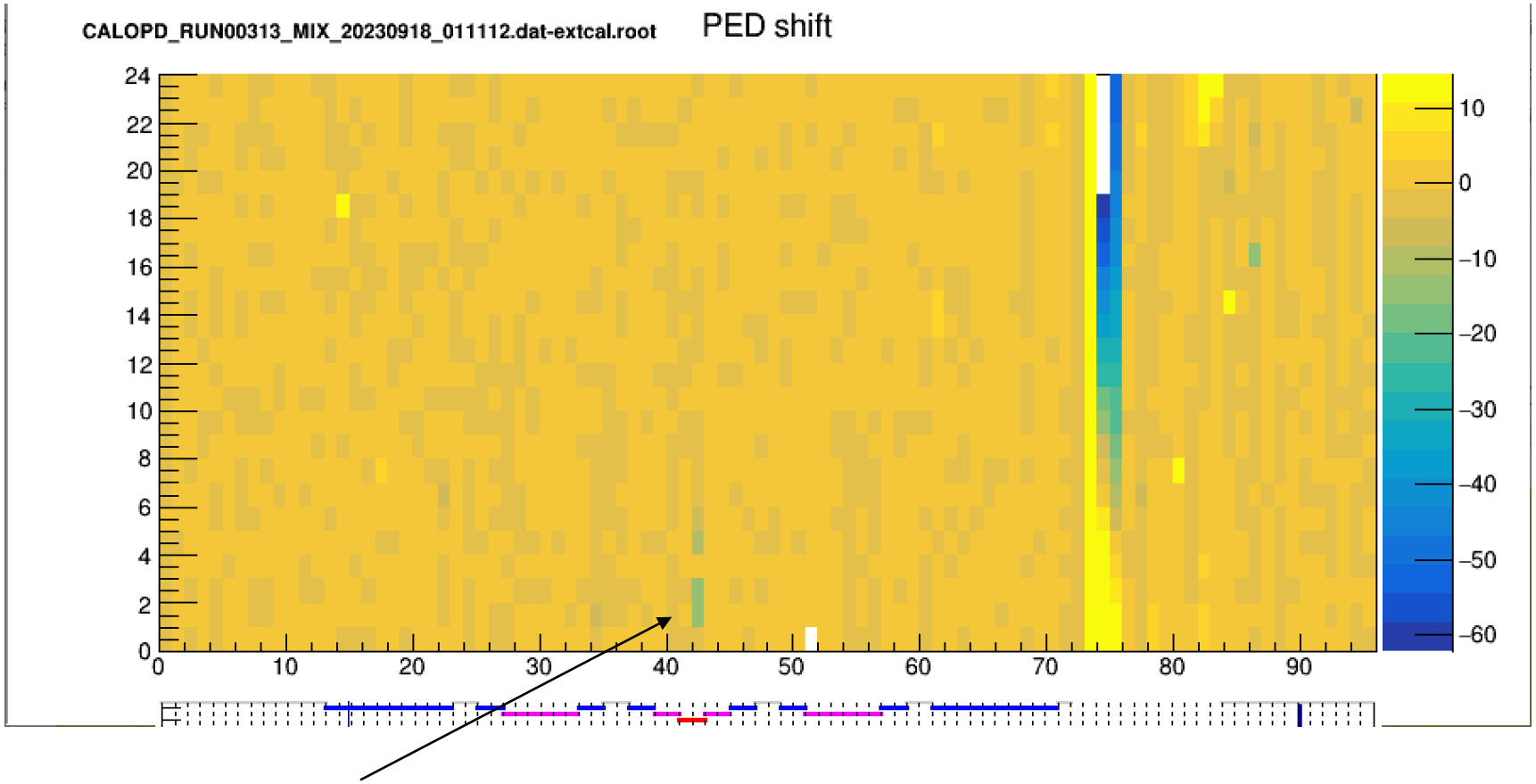
RMS(y - alpha*x) matrix 315.961

mean(y - alpha*x) fit 2.86748e-06

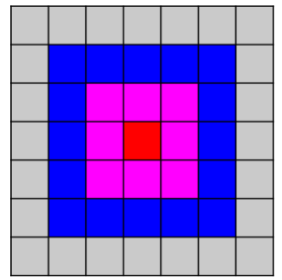
mean(y - alpha*x) matrix 5.11895e-06

Pedestal shift

20 GeV



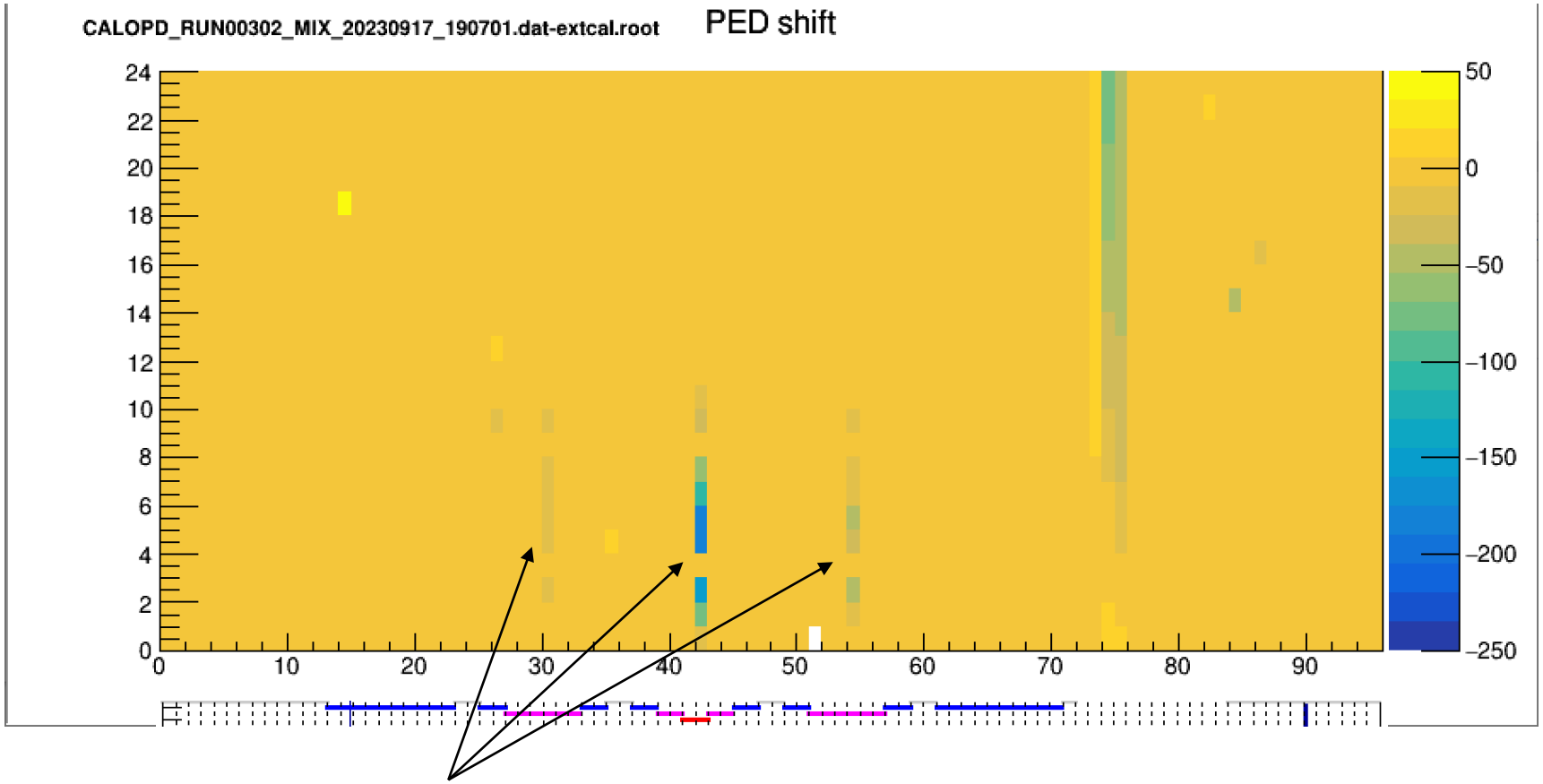
RMS(ADC-PED)



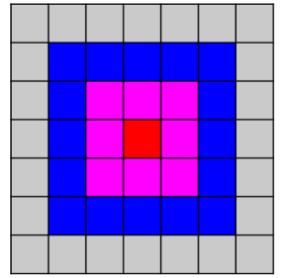
L’effetto e` modesto e limitato alla colonna centrale

Pedestal shift

243 GeV

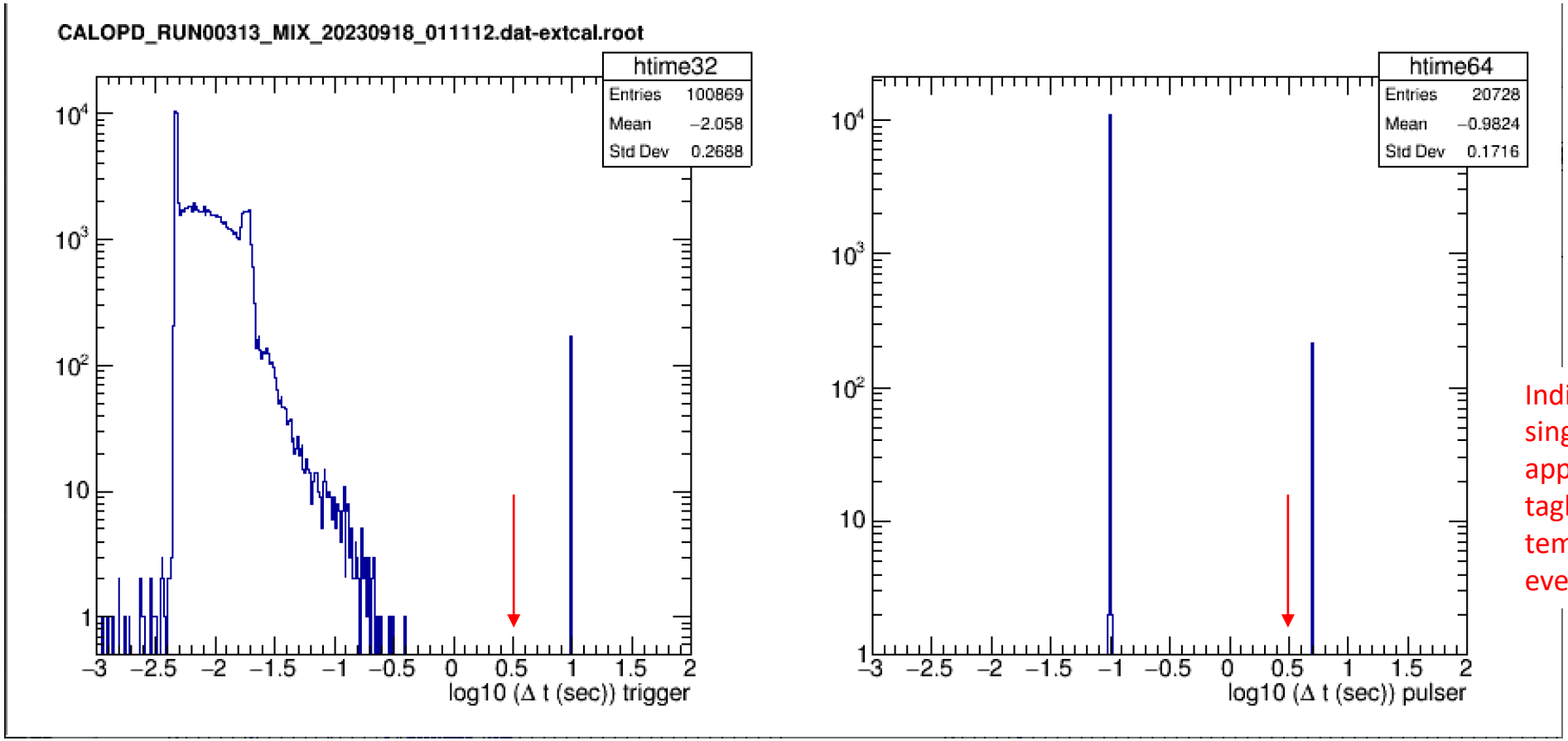


RMS(ADC-PED)



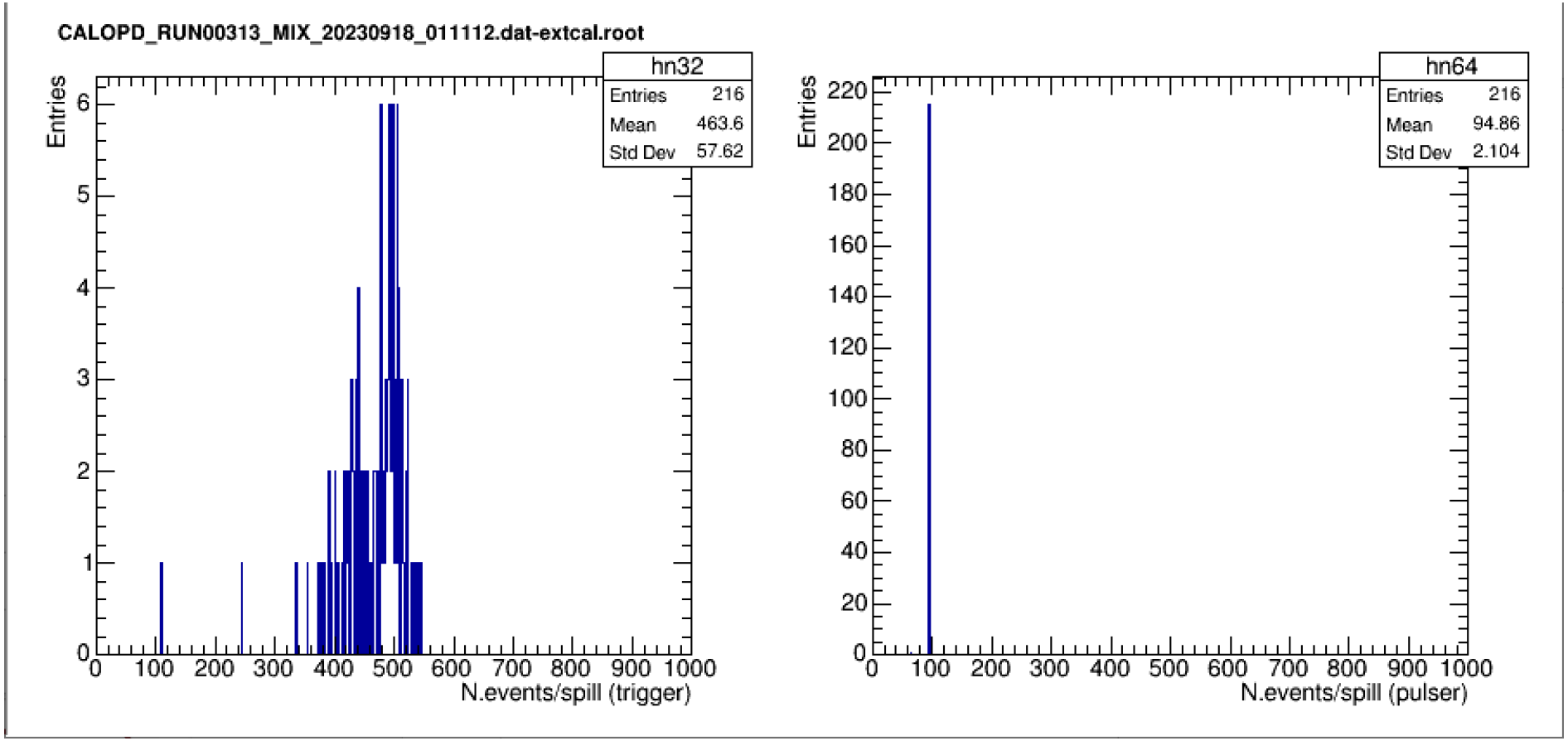
L’effetto e` piu` marcato e visible anche per le colonne laterali

20 GeV

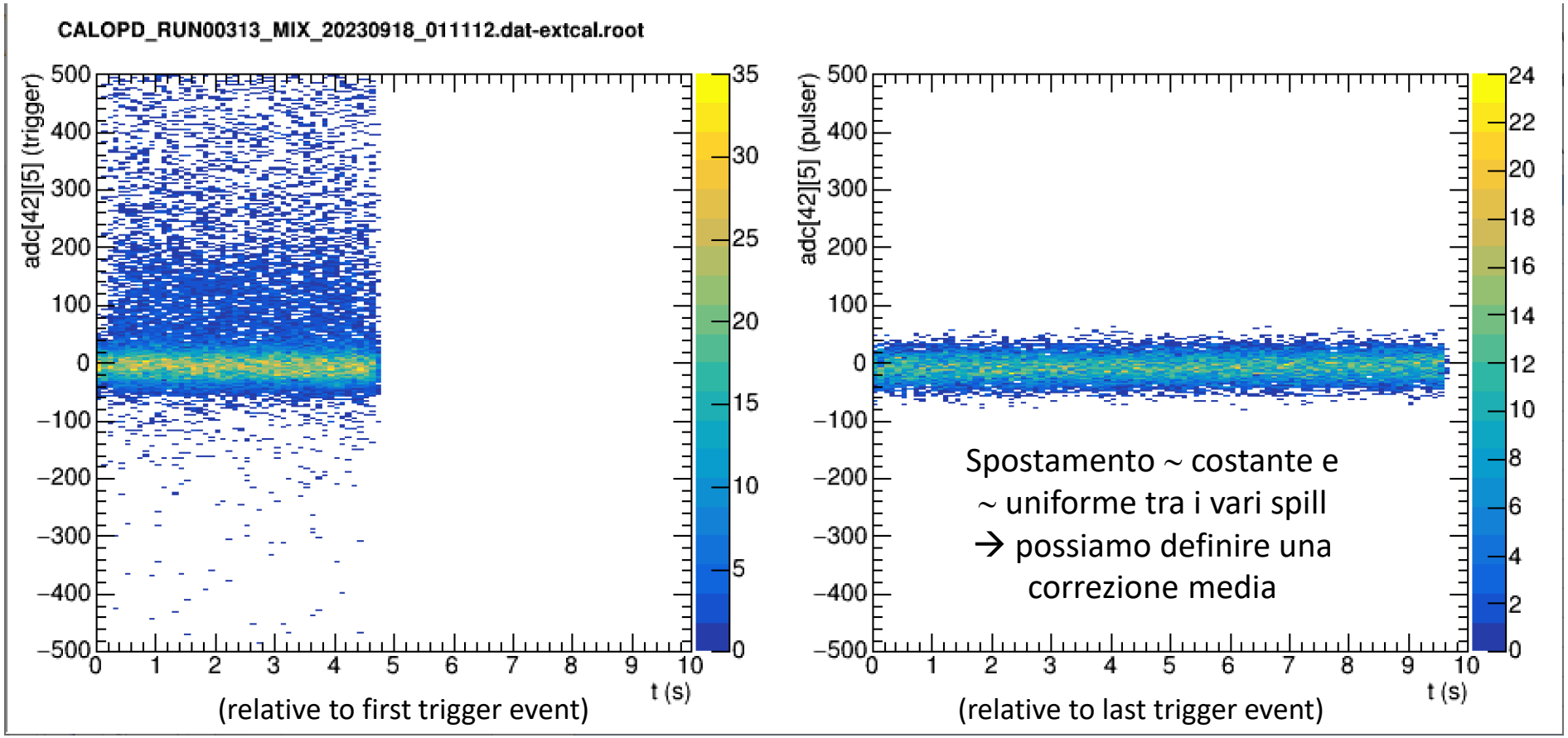


Individuati i singoli spill applicando un taglio alla distanza temporale tra gli eventi

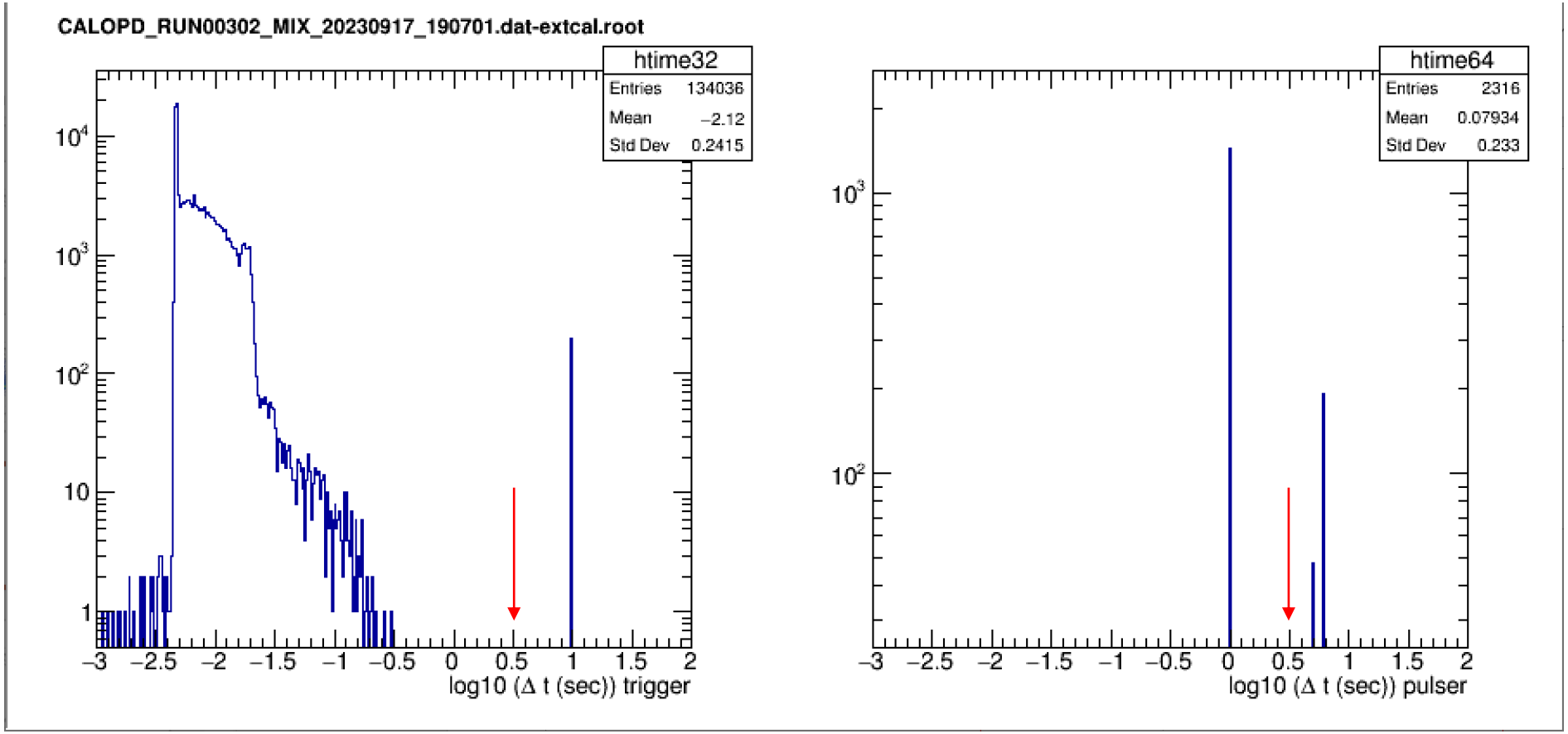
20 GeV


CALOPD_RUN00313_MIX_20230918_011112.dat-extcal.root
hn32
Entries 216
Mean 463.6
Std Dev 57.62
Entries
N.events/spill (trigger)
hn64
Entries 216
Mean 94.86
Std Dev 2.104
Entries
N.events/spill (pulser)

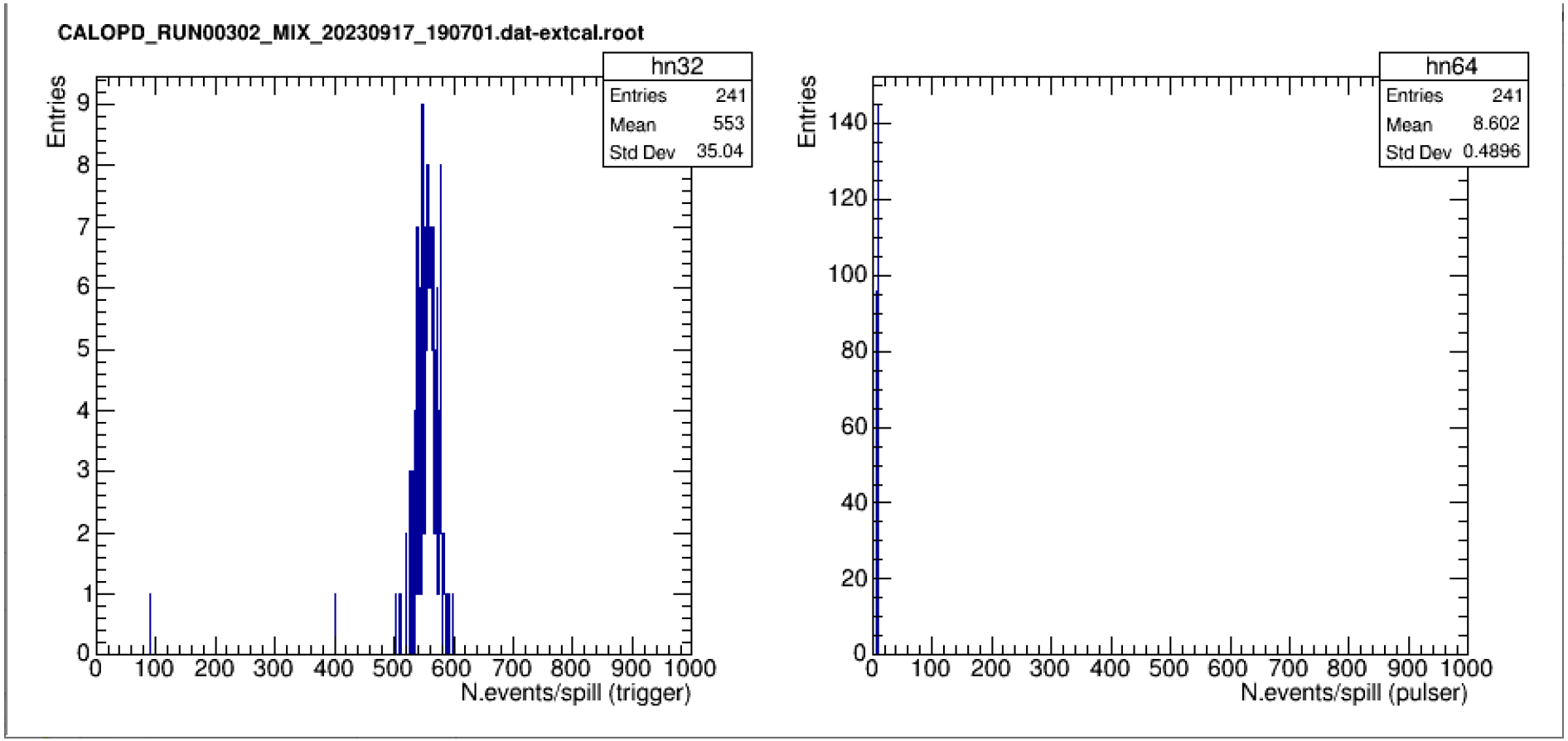
20 GeV


CALOPD_RUN00313_MIX_20230918_011112.dat-extcal.root
adc[42][5] (trigger)
t (s)
(relative to first trigger event)
adc[42][5] (pulser)
t (s)
(relative to last trigger event)
Spostamento ~ costante e
~ uniforme tra i vari spill
→ possiamo definire una
correzione media

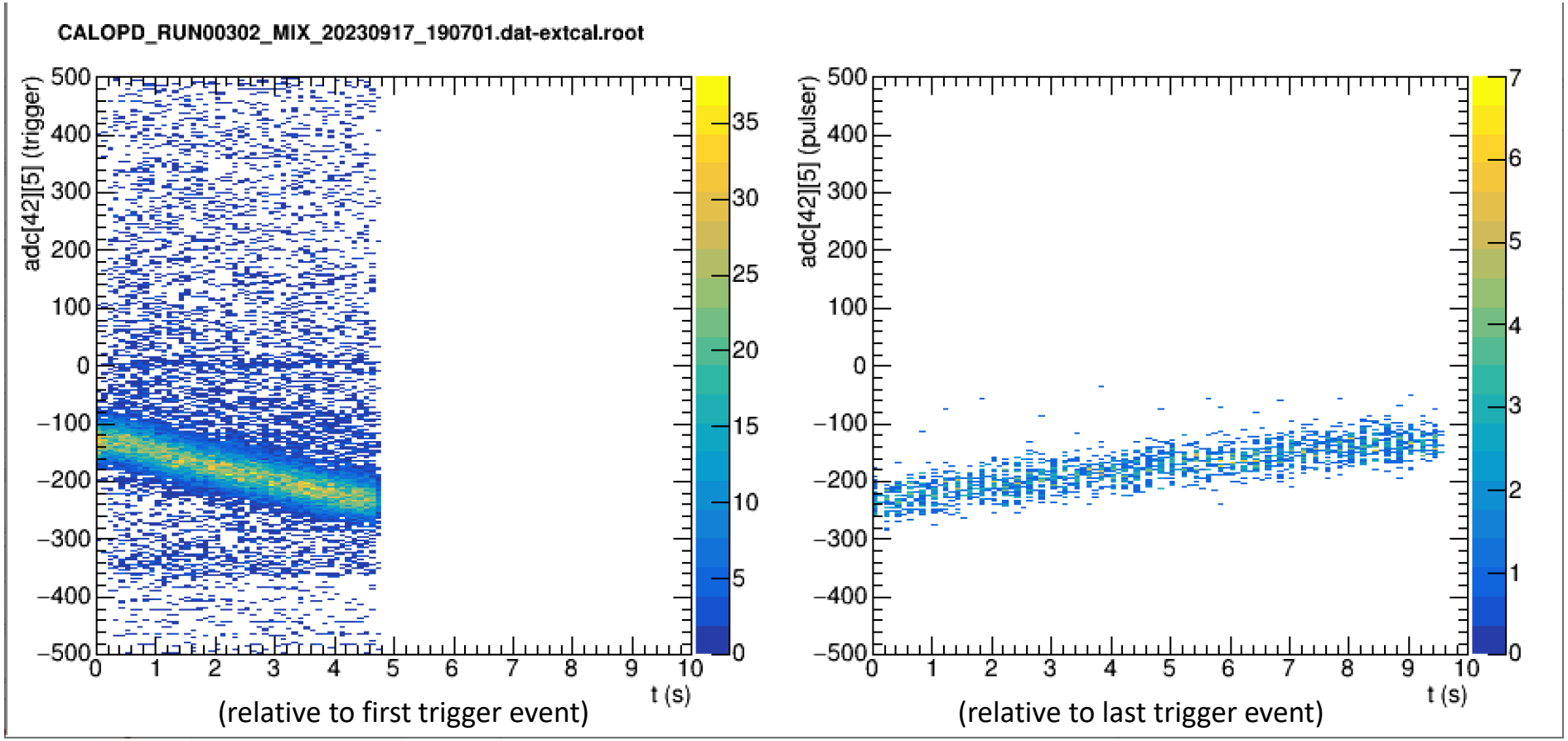
243 GeV


CALOPD_RUN00302_MIX_20230917_190701.dat-extcal.root
htime32
Entries 134036
Mean −2.12
Std Dev 0.2415
log10 (Δ t (sec)) trigger
htime64
Entries 2316
Mean 0.07934
Std Dev 0.233
log10 (Δ t (sec)) pulser

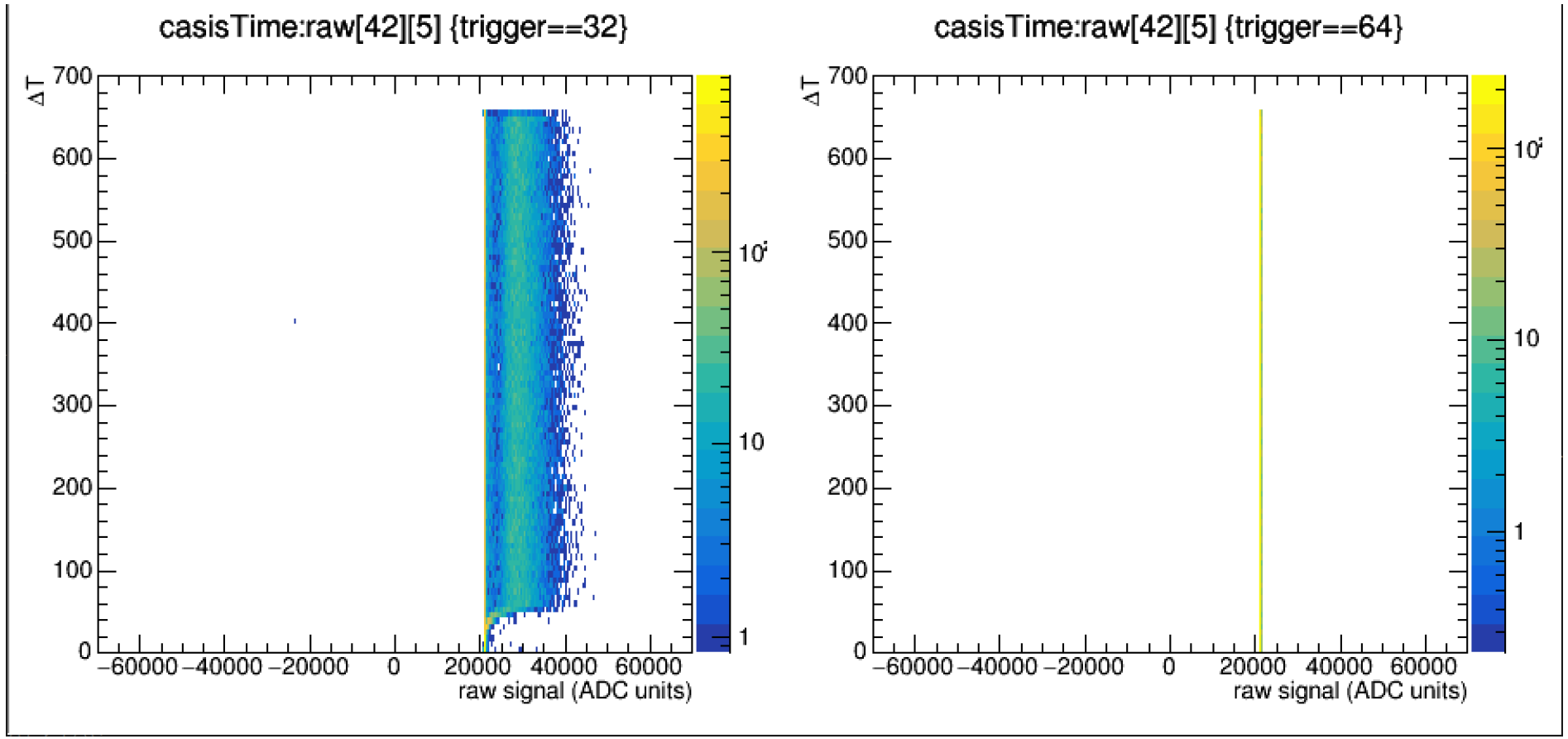
243 GeV


CALOPD_RUN00302_MIX_20230917_190701.dat-extcal.root
hn32
Entries 241
Mean 553
Std Dev 35.04
Entries
N.events/spill (trigger)
hn64
Entries 241
Mean 8.602
Std Dev 0.4896
Entries
N.events/spill (pulser)

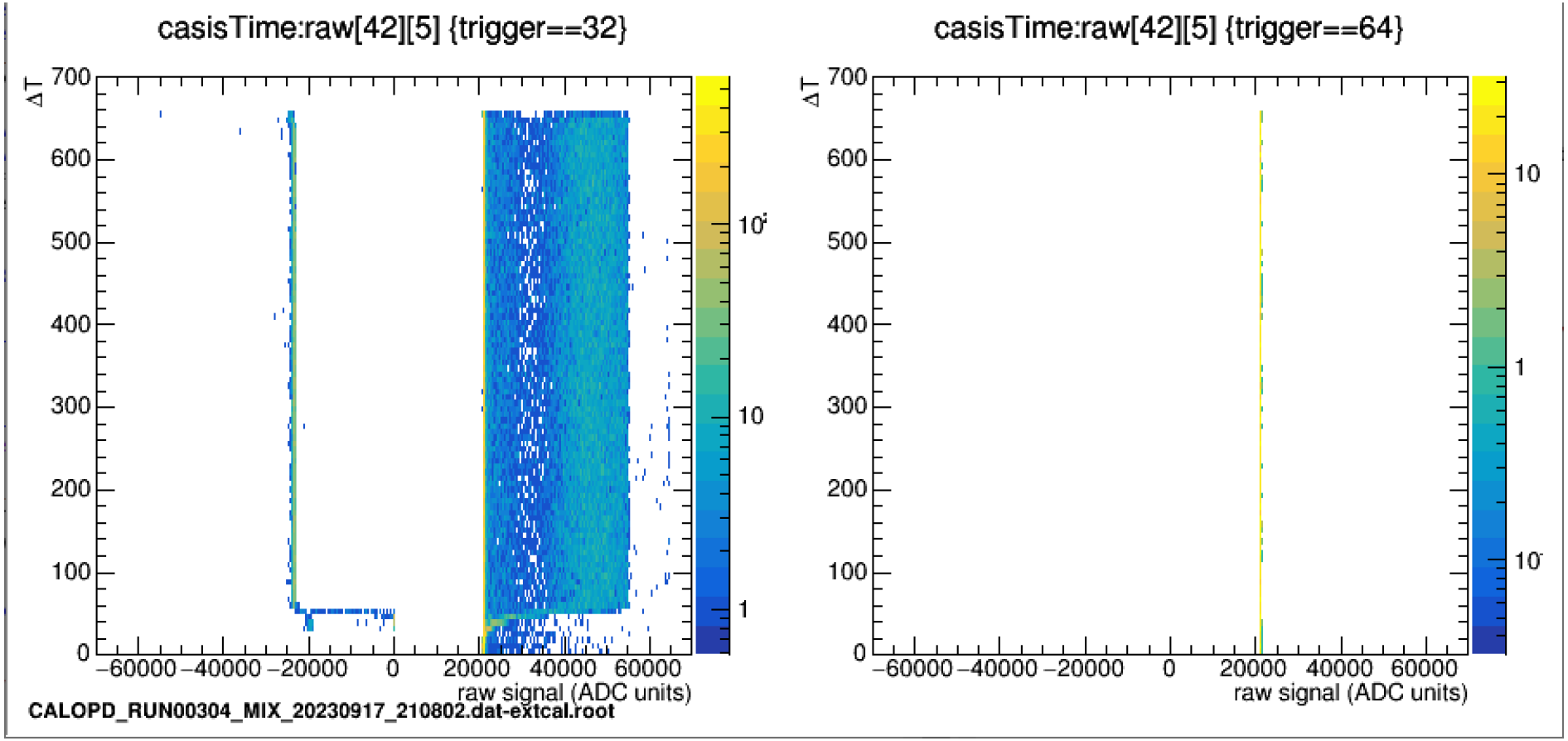
243 GeV


CALOPD_RUN00302_MIX_20230917_190701.dat-extcal.root
adc[42][5] (trigger)
t (s)
(relative to first trigger event)
adc[42][5] (pulser)
t (s)
(relative to last trigger event)

20 GeV


casisTime:raw[42][5] {trigger==32}
ΔT
700
600
500
400
300
200
100
0
−60000 −40000 −20000 0 20000 40000 60000
raw signal (ADC units)
10²
10
1
casisTime:raw[42][5] {trigger==64}
ΔT
700
600
500
400
300
200
100
0
−60000 −40000 −20000 0 20000 40000 60000
raw signal (ADC units)
10²
10
1

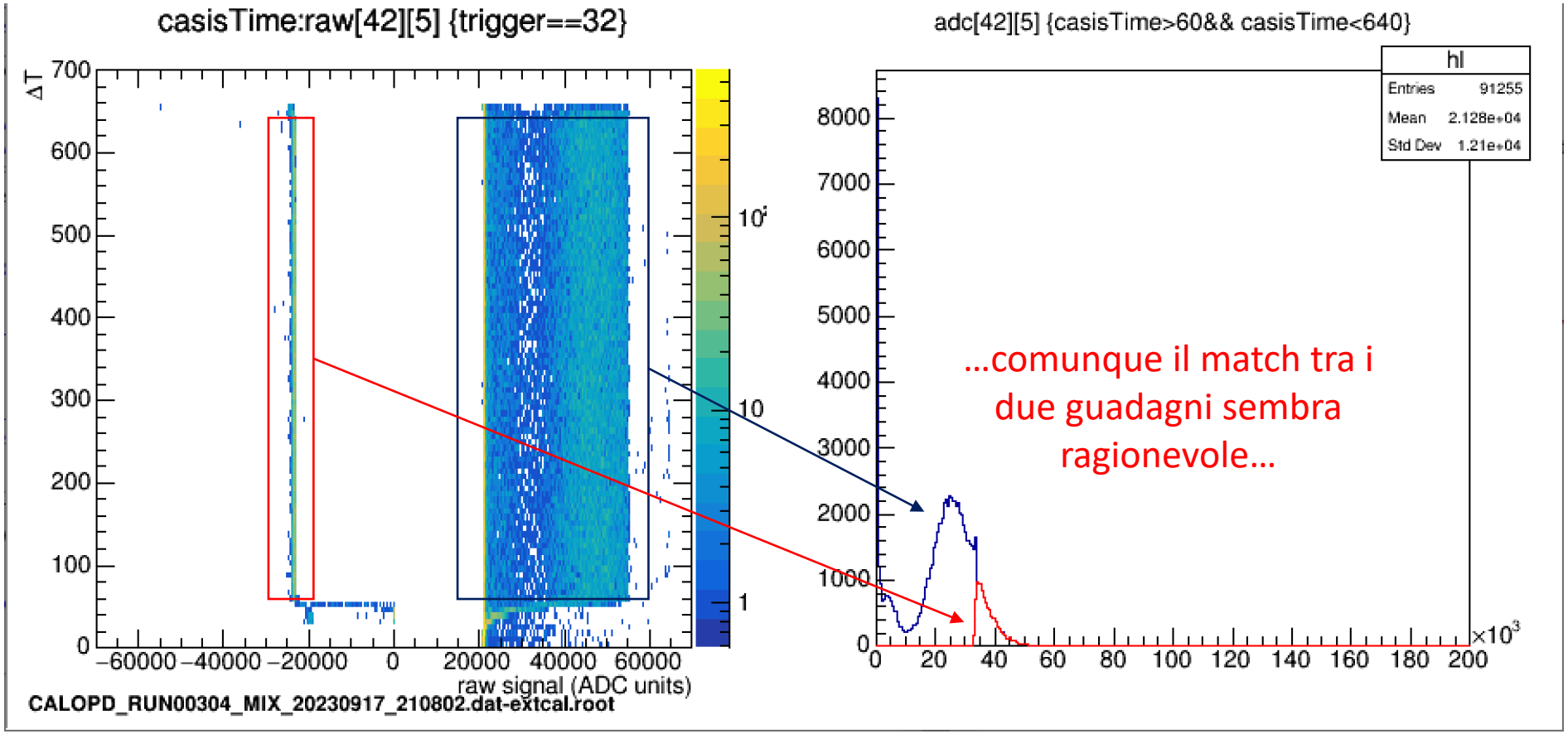
50 GeV


casisTime:raw[42][5] {trigger==32}
ΔT
700
600
500
400
300
200
100
0
−60000 −40000 −20000 0 20000 40000 60000
raw signal (ADC units)
10²
10
1
CALOPD_RUN00304_MIX_20230917_210802.dat-extcal.root
casisTime:raw[42][5] {trigger==64}
ΔT
700
600
500
400
300
200
100
0
−60000 −40000 −20000 0 20000 40000 60000
raw signal (ADC units)
10
1
10⁻¹

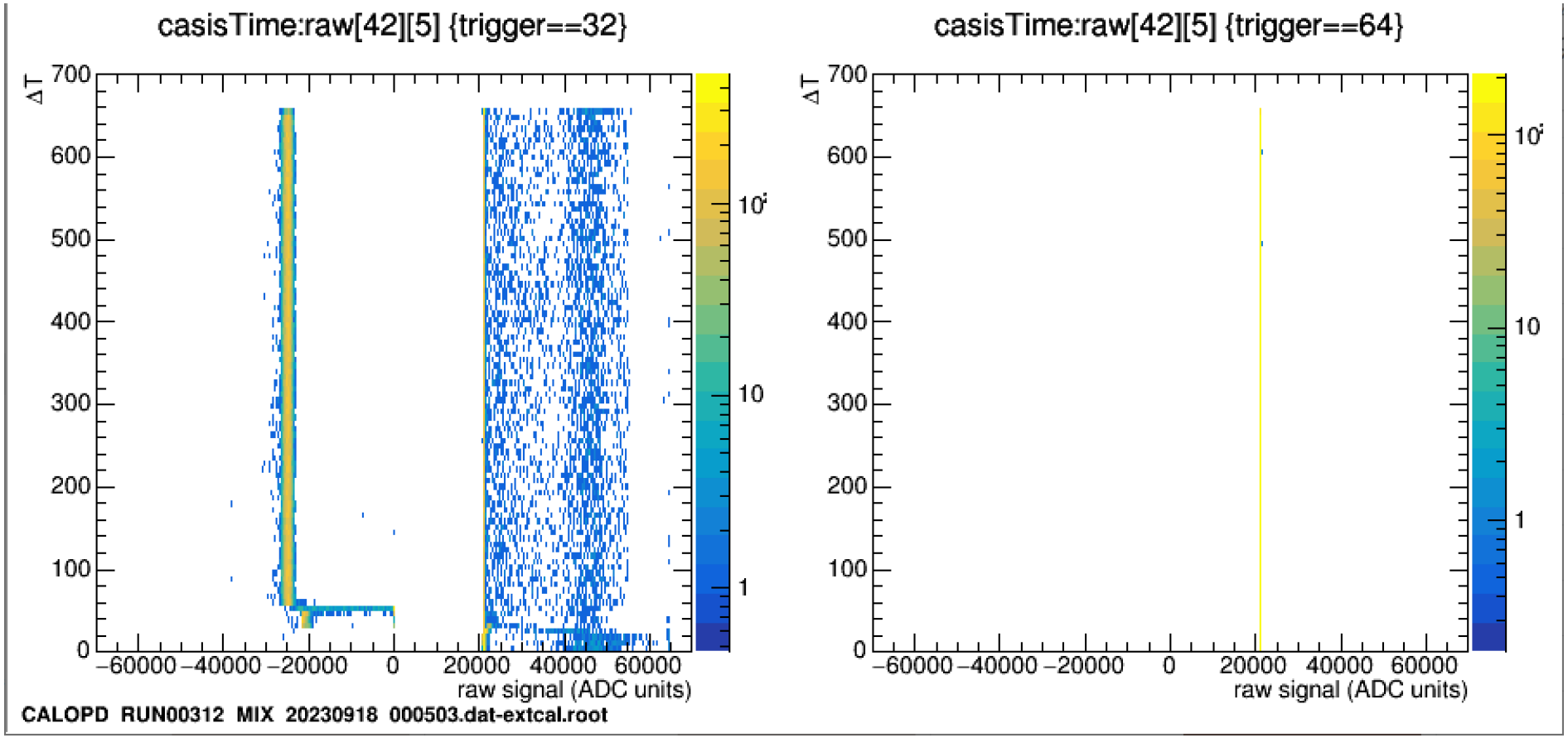
```
const float GAINFACTOR = 20.0488; // ratio between 2 gains
const float GAINJUMP = 1300; // jumps between 2 gains

// --------------------
// guadagno dinamico
// --------------------
signal[iHydra][iHydraChannel] = buf - (float)param->ped[iHydra][iHydraChannel];
if (gain[iHydra][iHydraChannel] == 0)
  signal[iHydra][iHydraChannel] -= (float)cn;
if (gain[iHydra][iHydraChannel] == 1)
  signal[iHydra][iHydraChannel] *= GAINFACTOR; // 20.;
if (gain[iHydra][iHydraChannel] == 1)
  signal[iHydra][iHydraChannel] -= GAINJUMP; // 2000.;
```

Mi sembra dal codice che il CN non venga sottratto in basso Guadagno… perche`?

50 GeV



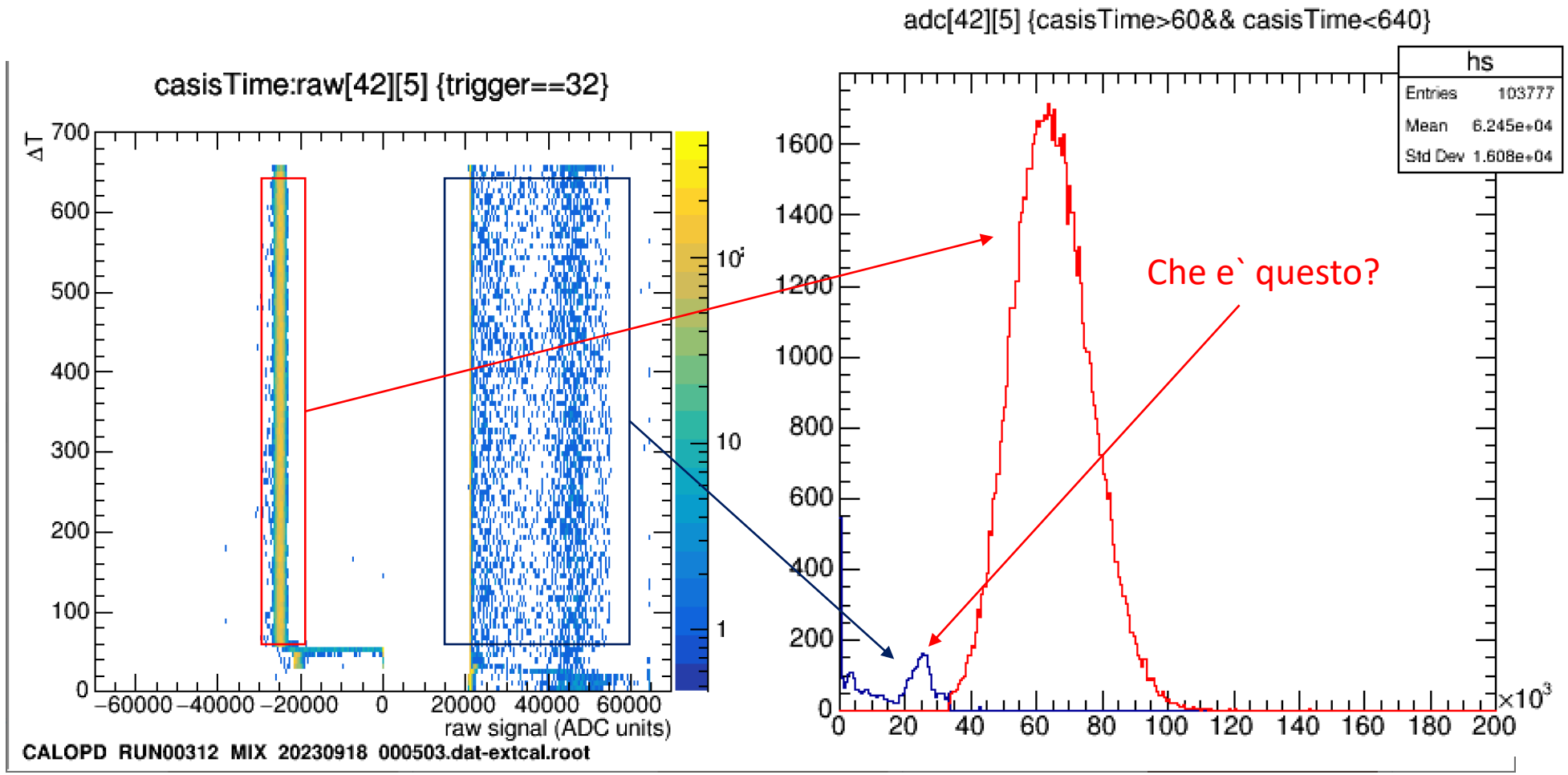
100 GeV


casisTime:raw[42][5] {trigger==32}
ΔT
700
600
500
400
300
200
100
0
−60000 −40000 −20000 0 20000 40000 60000
raw signal (ADC units)
10²
10
1
CALOPD RUN00312 MIX 20230918 000503.dat-extcal.root
casisTime:raw[42][5] {trigger==64}
ΔT
700
600
500
400
300
200
100
0
−60000 −40000 −20000 0 20000 40000 60000
raw signal (ADC units)
10²
10
1

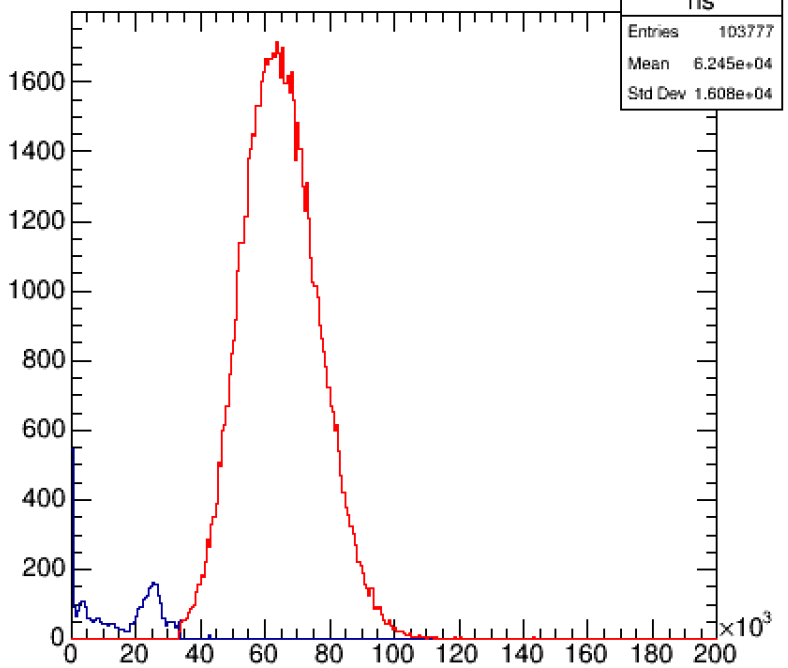
```
const float GAINFACTOR = 20.0488; // ratio between 2 gains
const float GAINJUMP = 1300; // jumps between 2 gains

// --------------------
// guadagno dinamico
// --------------------
signal[iHydra][iHydraChannel] = buf - (float)param->ped[iHydra][iHydraChannel];
if (gain[iHydra][iHydraChannel] == 0)
  signal[iHydra][iHydraChannel] -= (float)cn;
if (gain[iHydra][iHydraChannel] == 1)
  signal[iHydra][iHydraChannel] *= GAINFACTOR; // 20.;
if (gain[iHydra][iHydraChannel] == 1)
  signal[iHydra][iHydraChannel] -= GAINJUMP; // 2000.;
```

Mi sembra che il CN non venga sottratto in basso Guadagno… perche`?

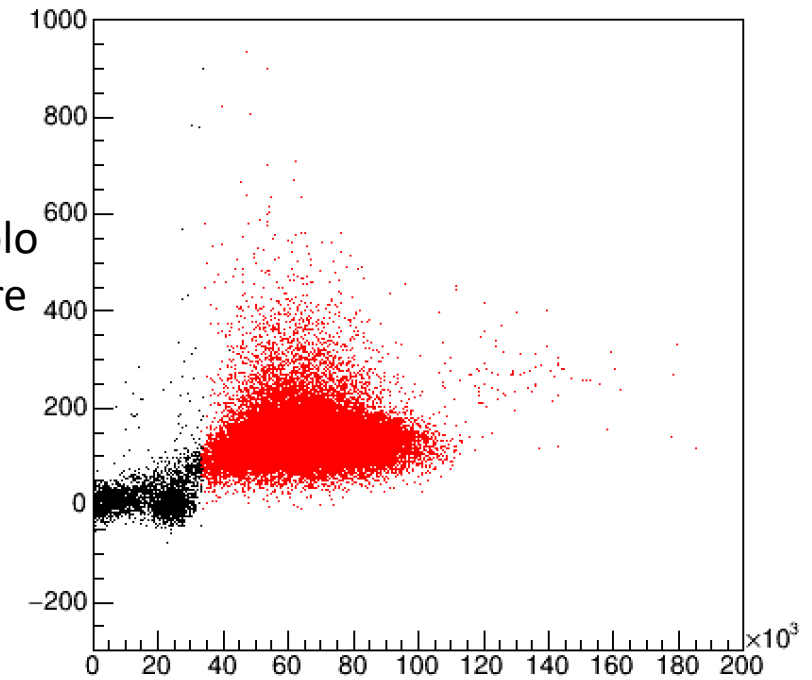
100 GeV

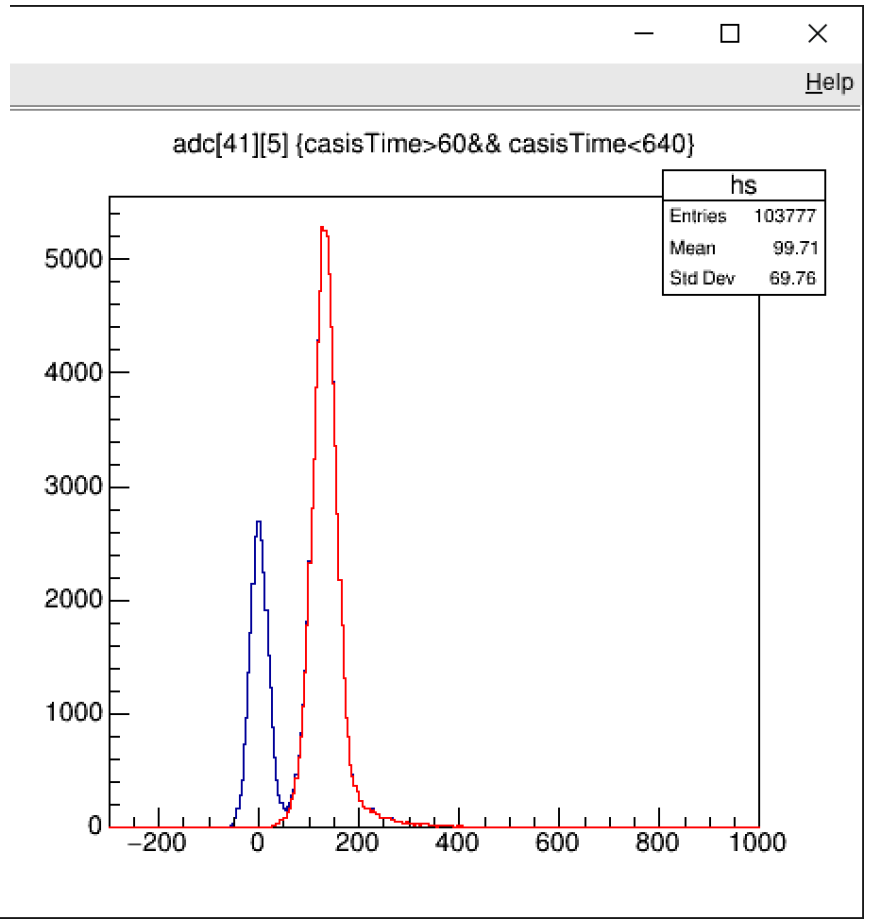


100 GeV

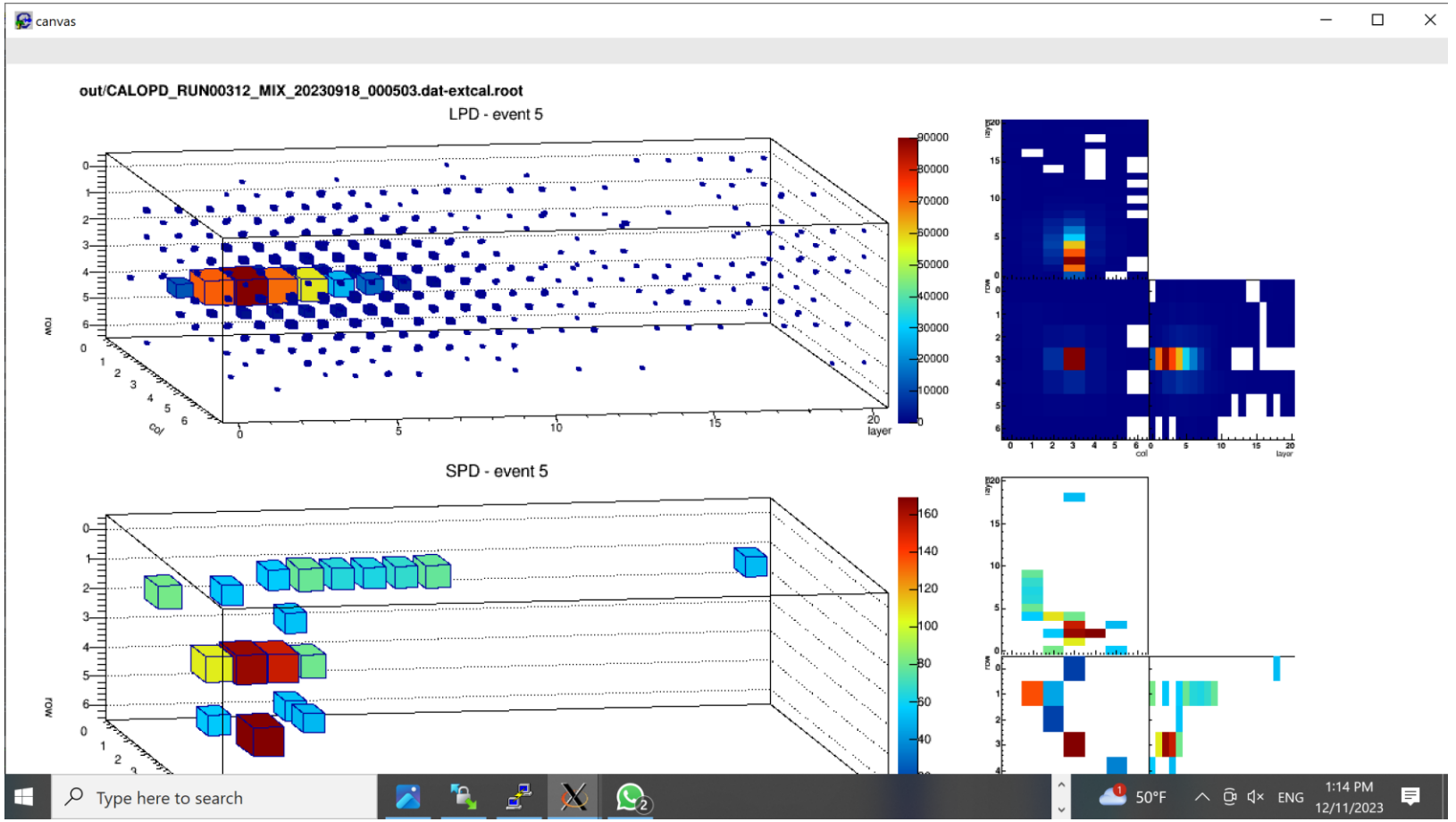


Il blob e` compatibile con solo rumore nel sensore piccolo





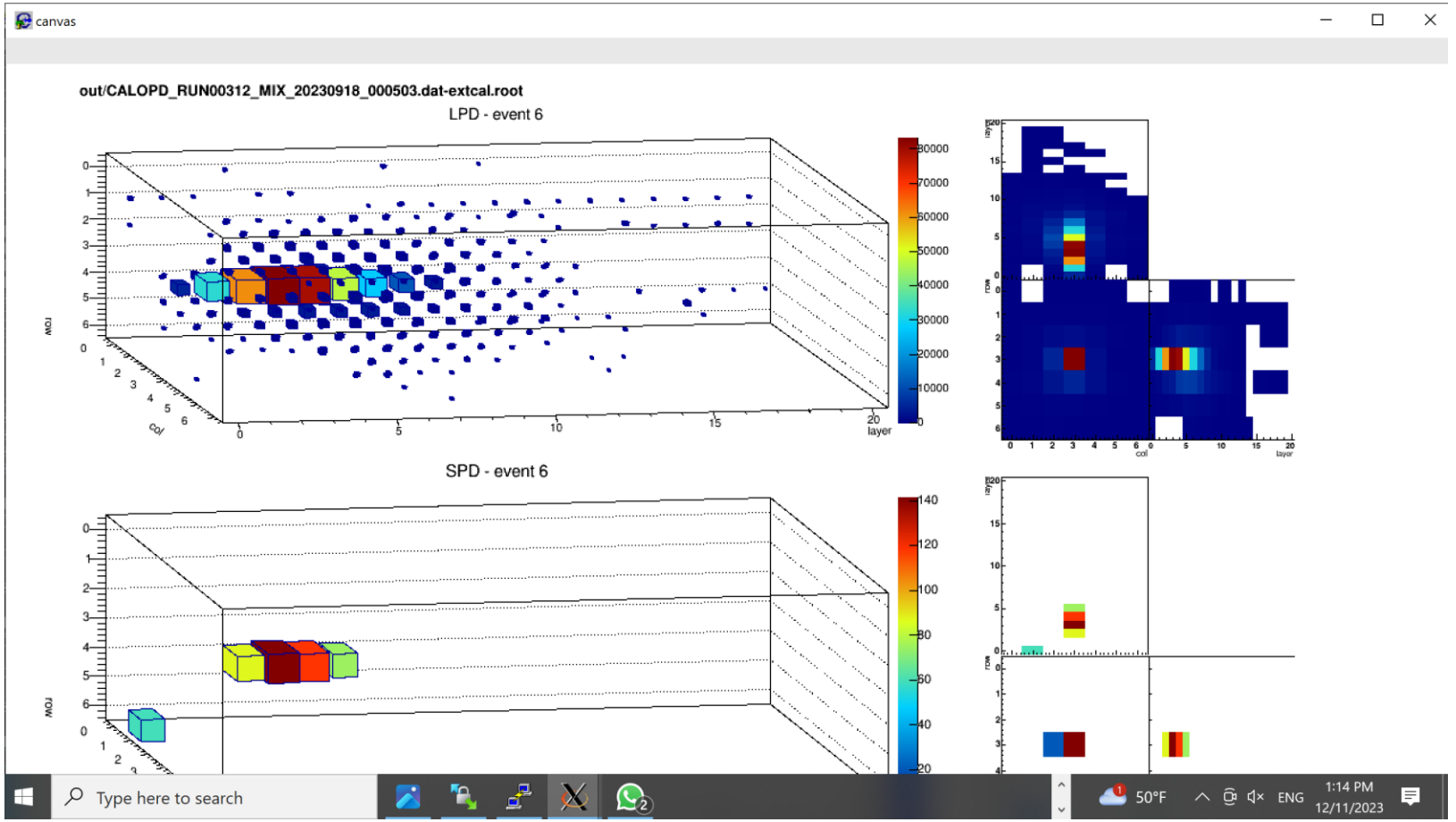
Evento buono



100 GeV

PDtree->Scan("Entry$","Sum$(adc[42][])>300000")

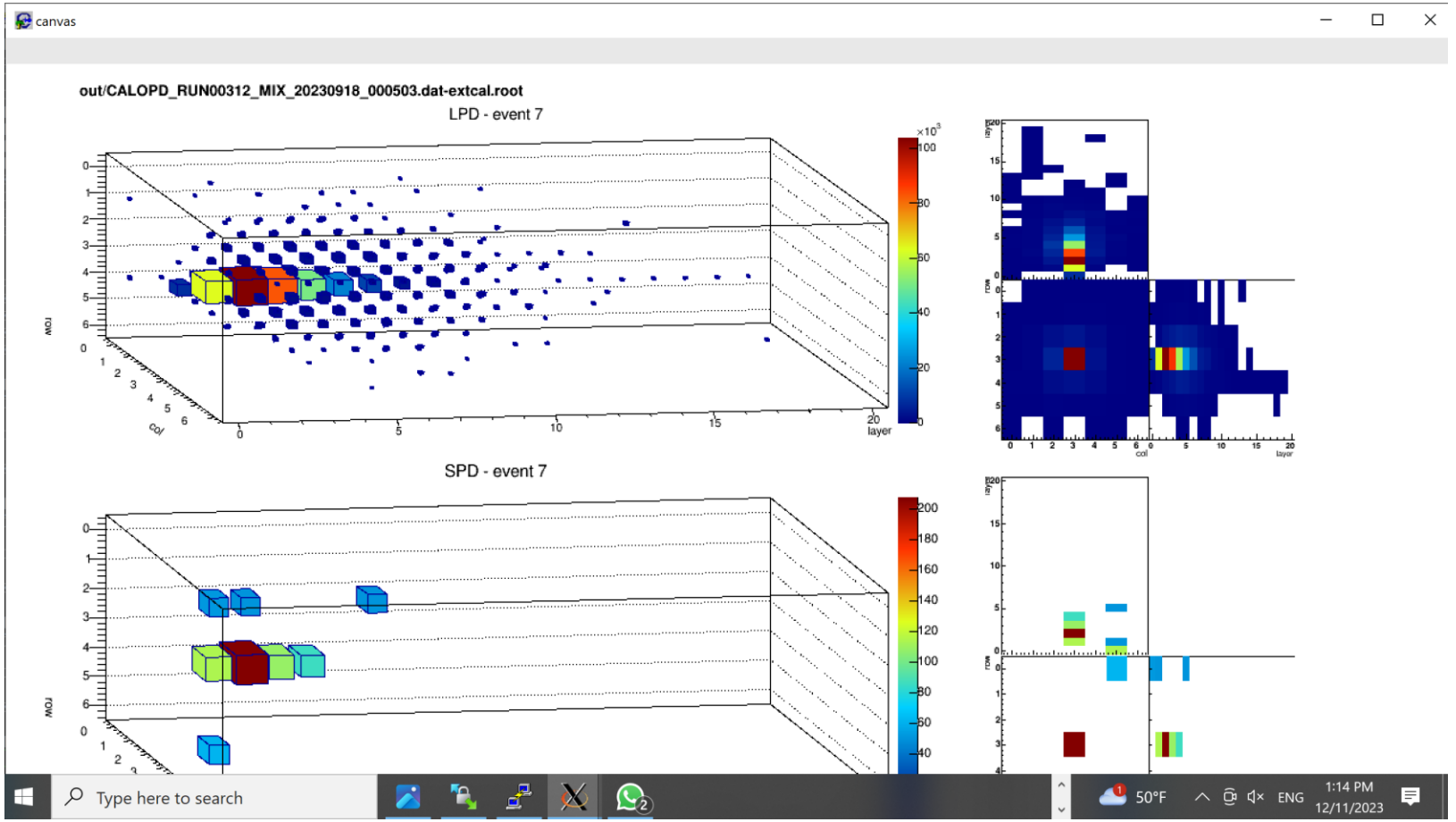
Evento buono



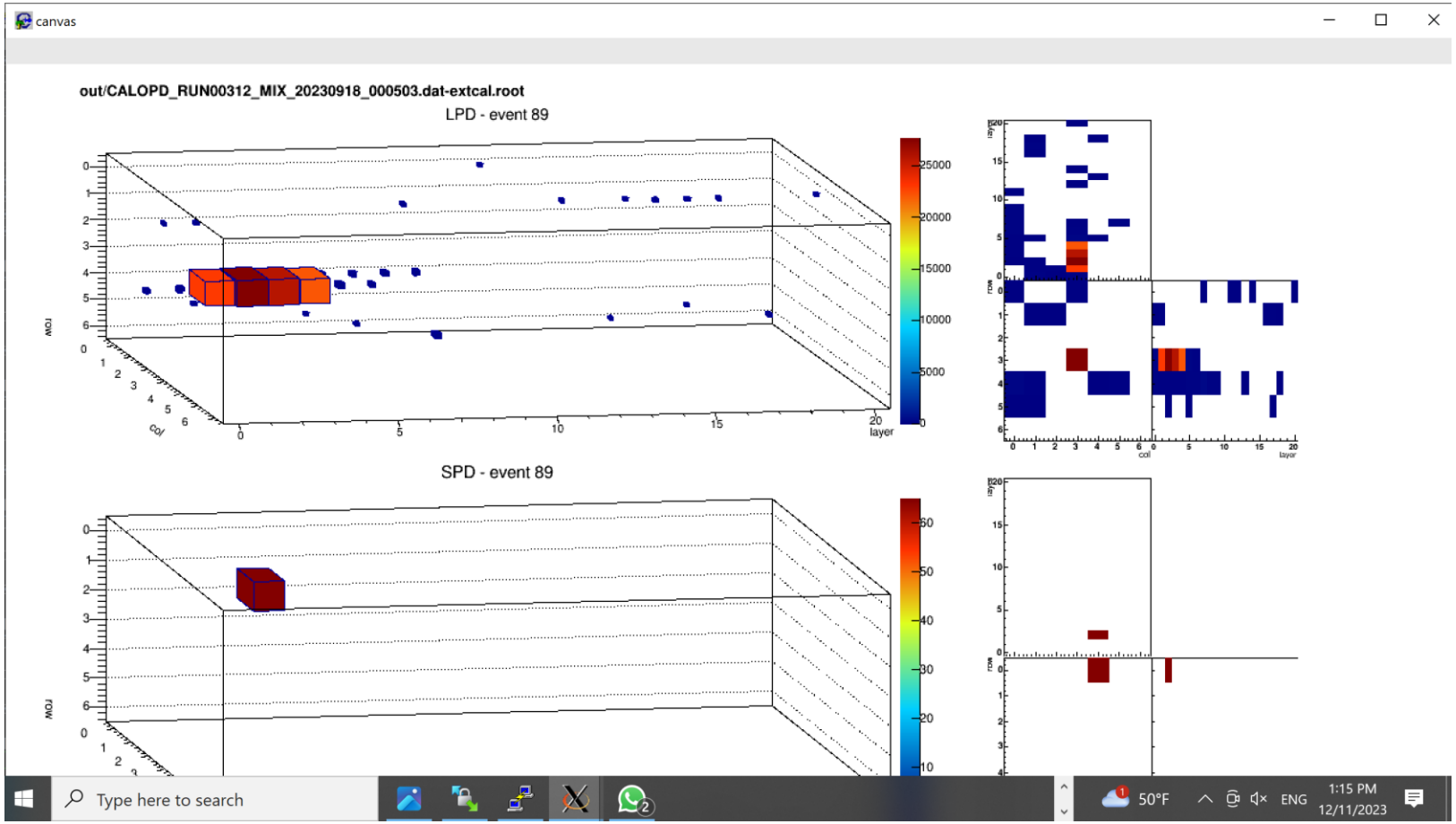
100 GeV

PDtree->Scan("Entry$","Sum$(adc[42][])>300000")

Evento buono



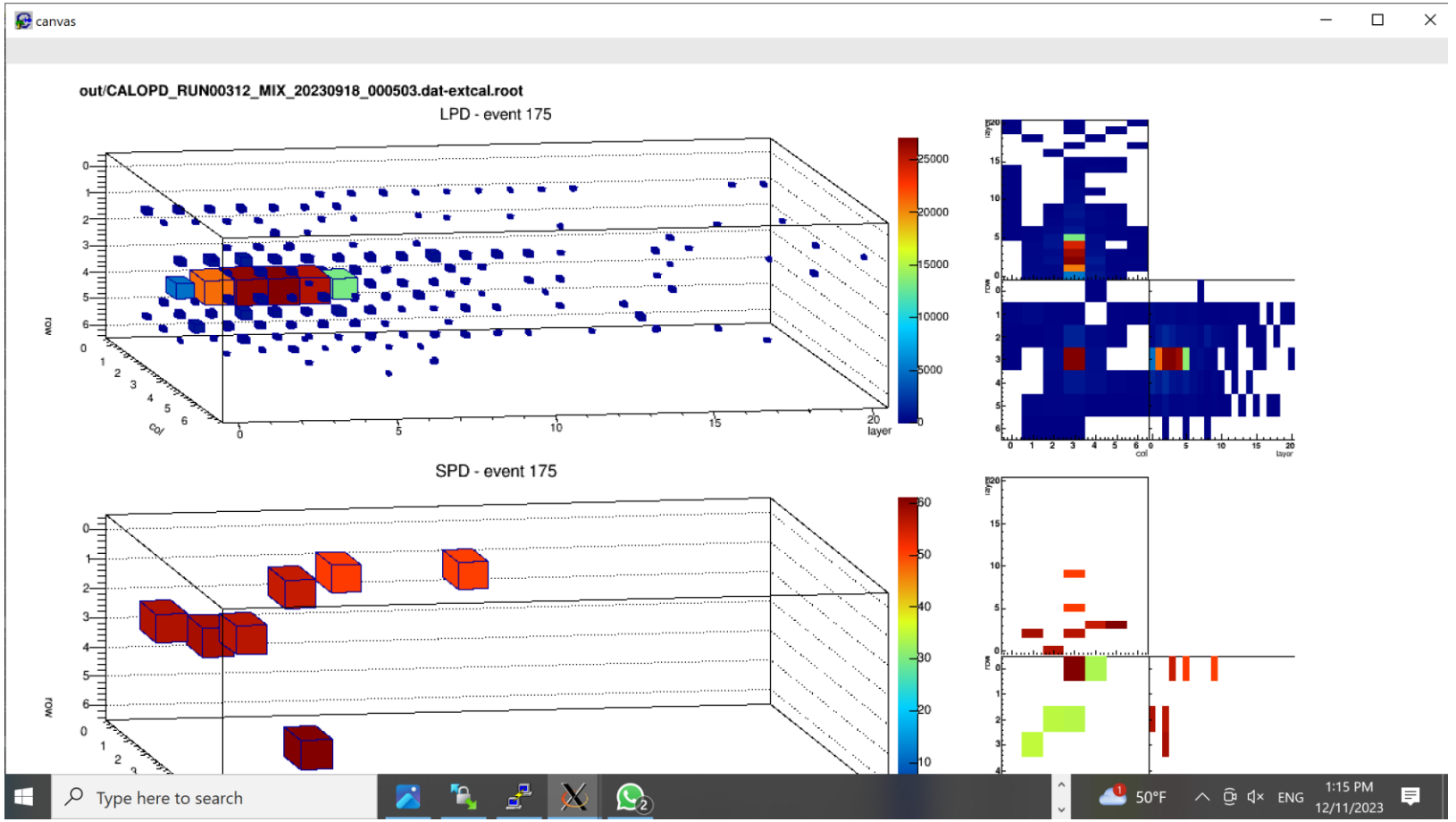
Evento cattivo



100 GeV

PDtree->Scan("Entry$","Sum$(adc[42][])<140000&&adc[42][5]>20000")

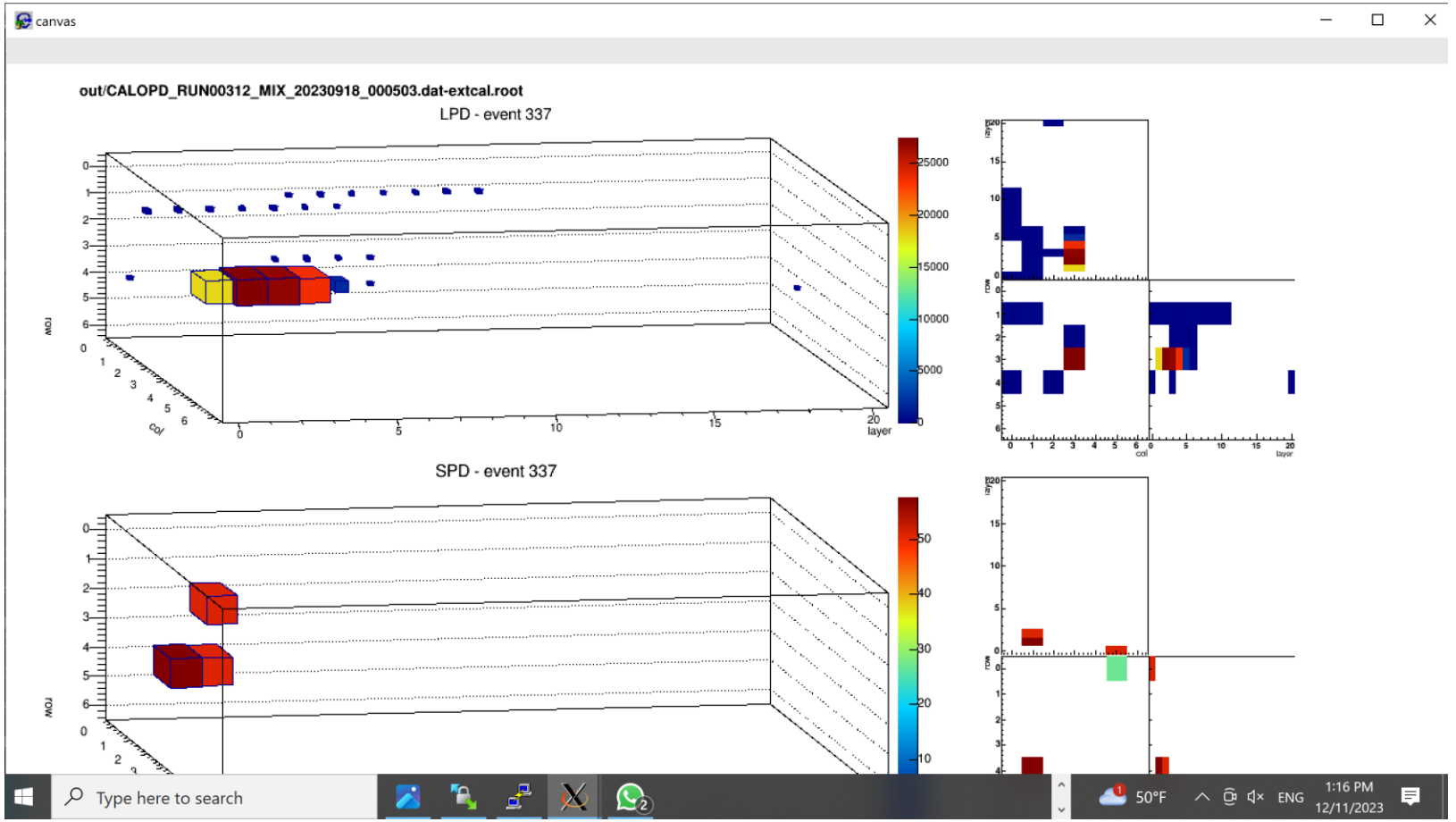
Evento cattivo



100 GeV

PDtree->Scan("Entry$","Sum$(adc[42][])<140000&&adc[42][5]>20000")

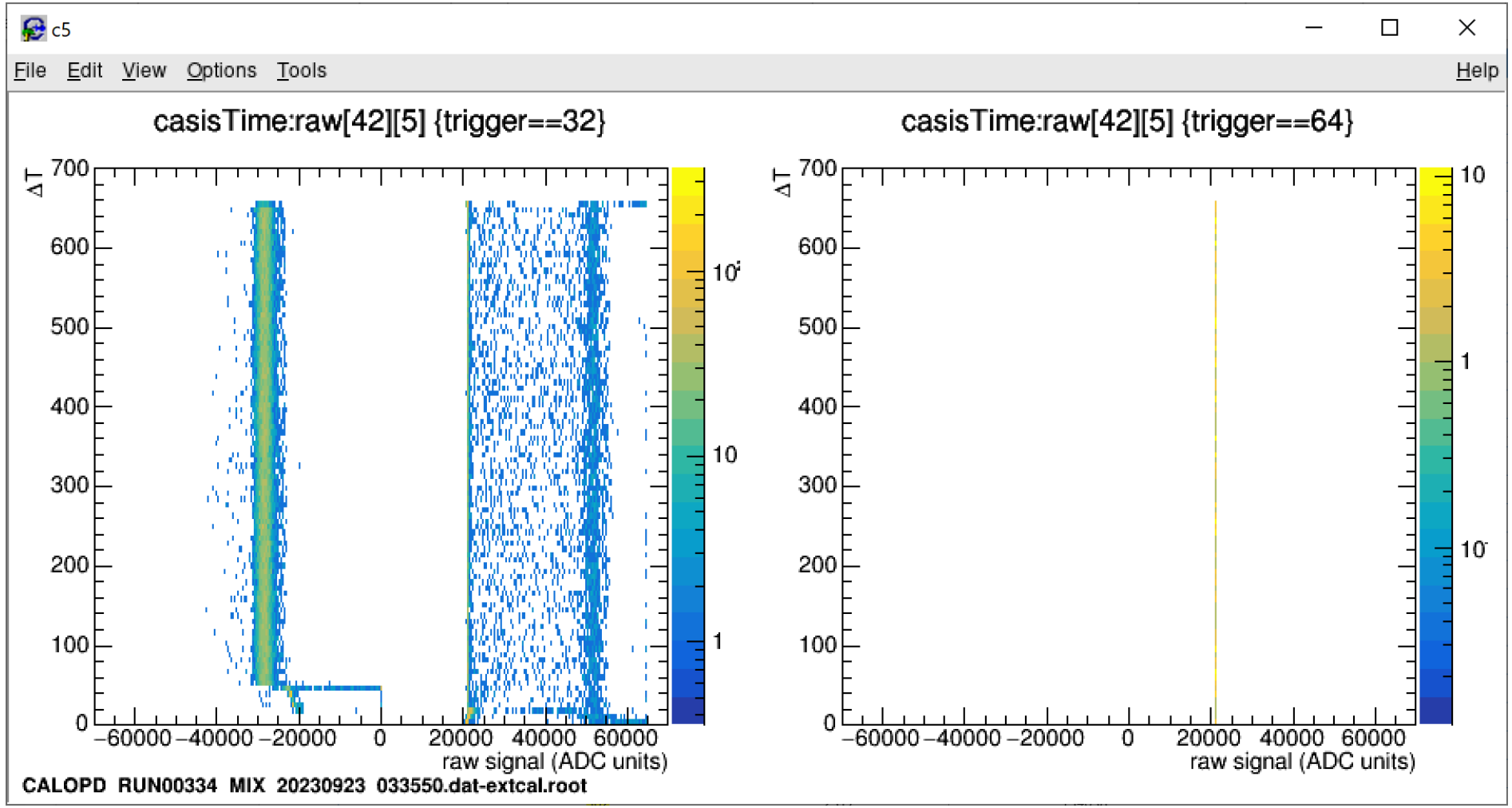
Evento cattivo



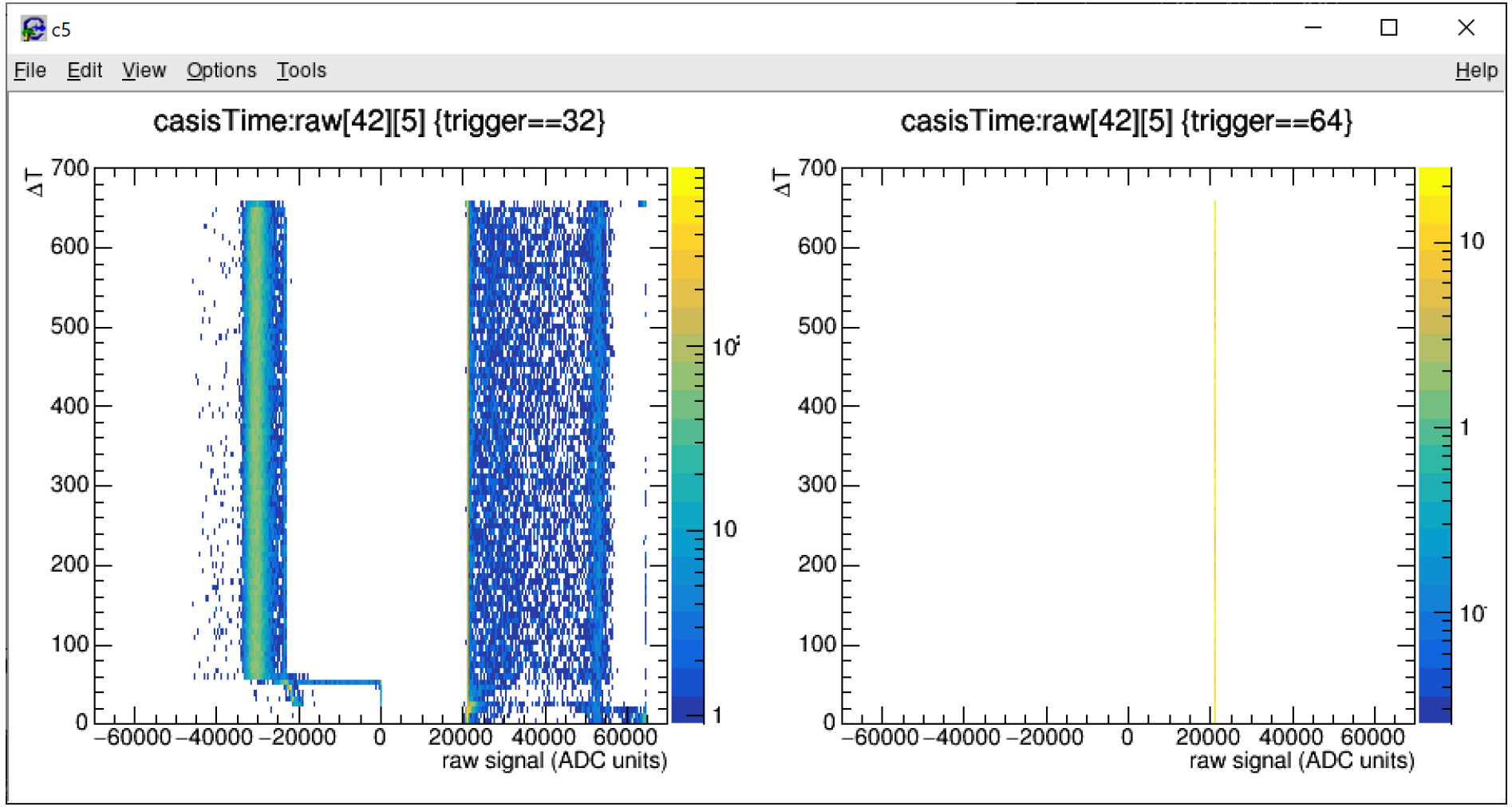
100 GeV

PDtree->Scan("Entry$","Sum$(adc[42][])<140000&&adc[42][5]>20000")

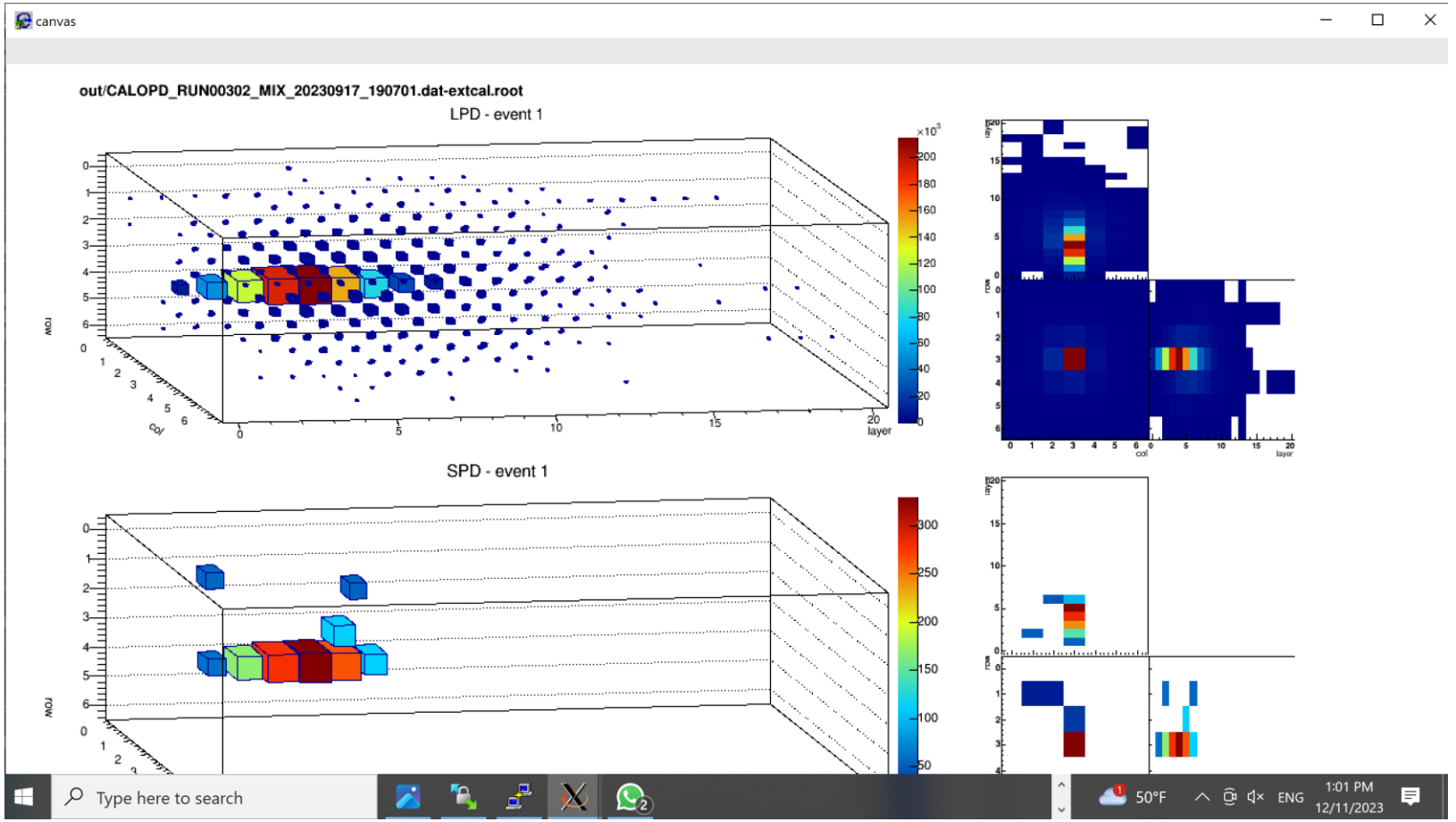
200 GeV


c5
File Edit View Options Tools Help
casisTime:raw[42][5] {trigger==32}
casisTime:raw[42][5] {trigger==64}
ΔT
raw signal (ADC units)
CALOPD RUN00334 MIX 20230923 033550.dat-extcal.root

243 GeV


c5
File Edit View Options Tools Help
casisTime:raw[42][5] {trigger==32}
casisTime:raw[42][5] {trigger==64}
ΔT
raw signal (ADC units)
0 100 200 300 400 500 600 700
−60000 −40000 −20000 0 20000 40000 60000
1 10 10²

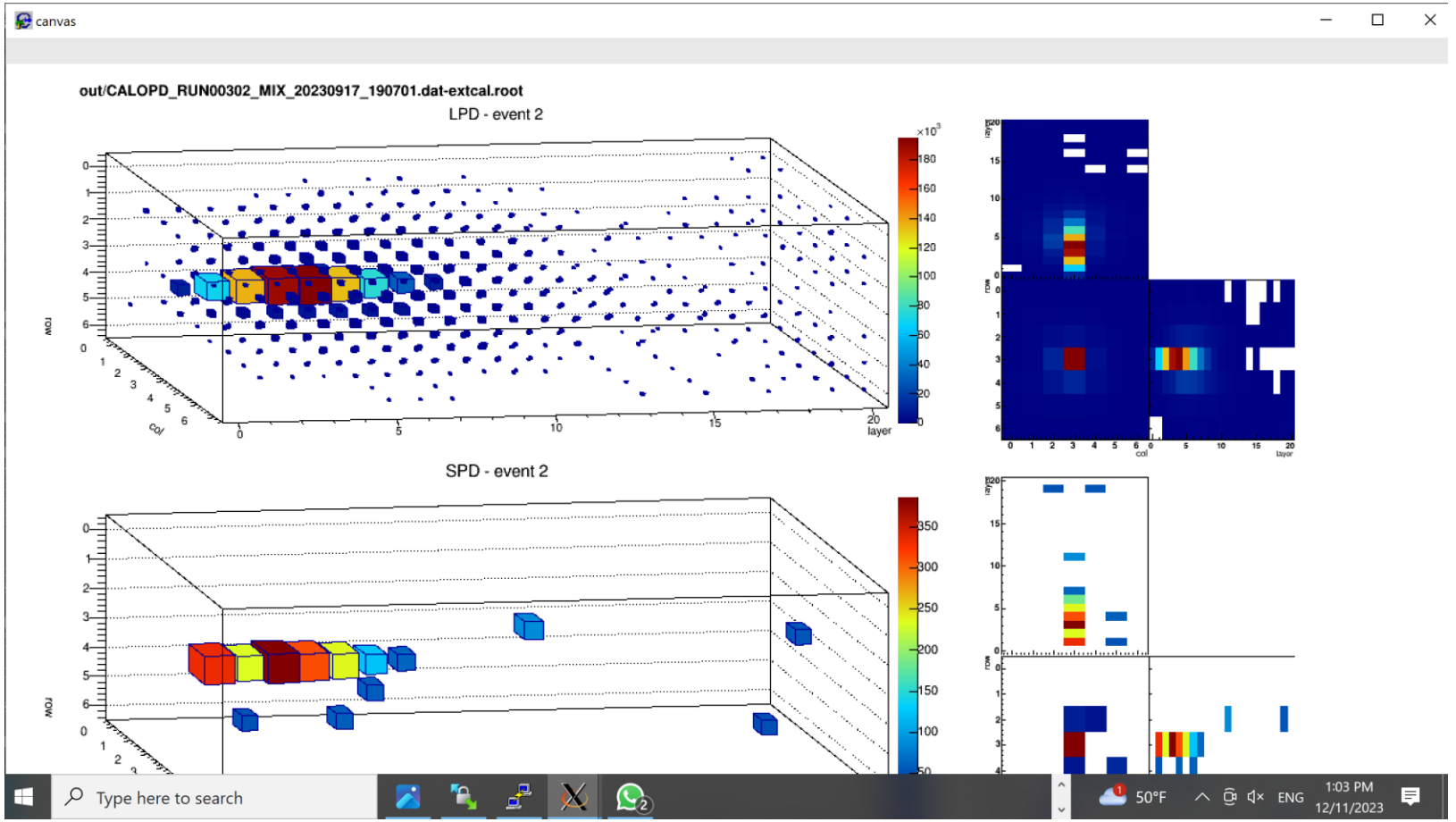
Evento buono



243 GeV

PDtree->Scan("Entry$","adc[42][5]>120000")

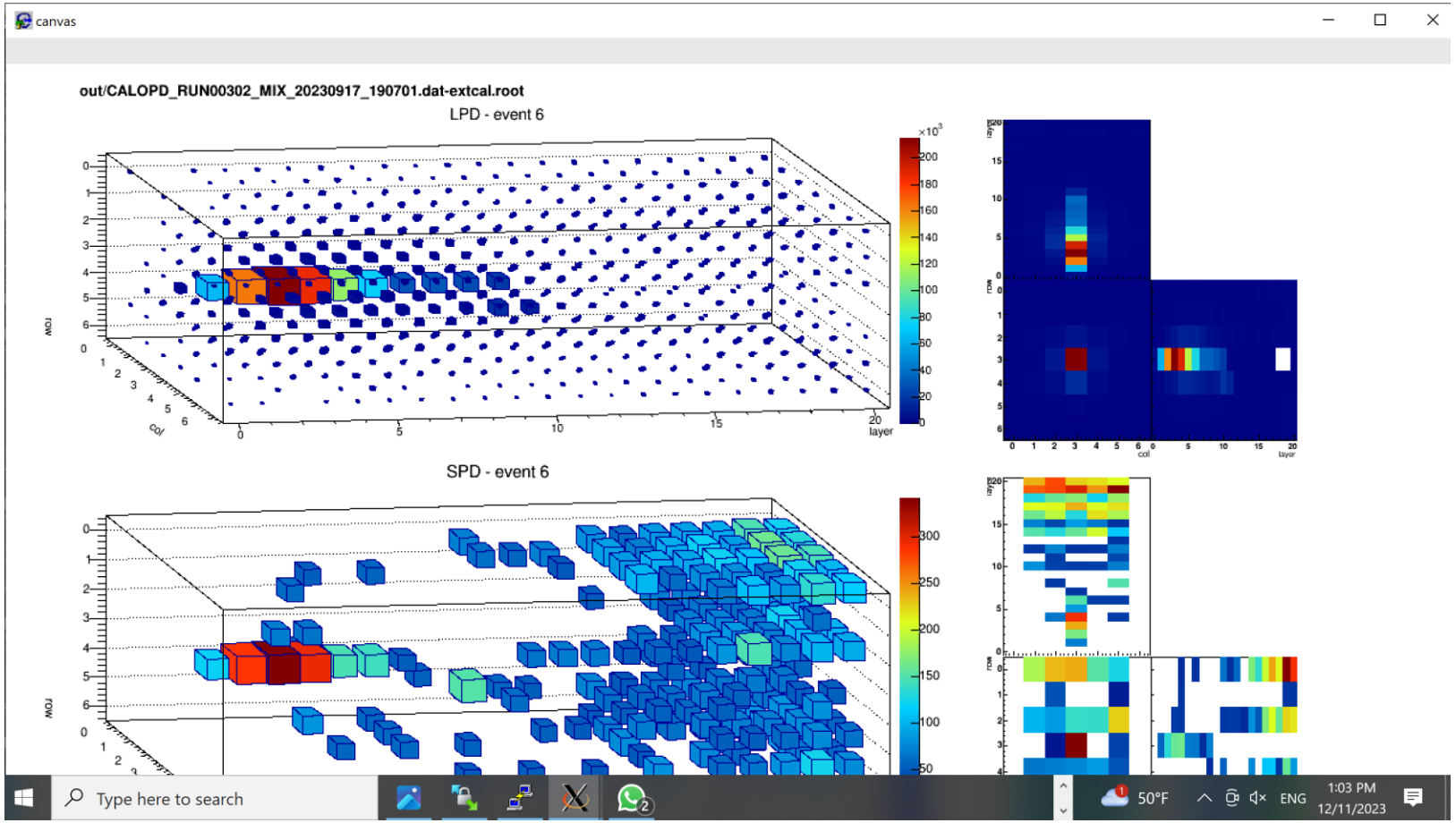
Evento buono



243 GeV

PDtree->Scan("Entry$","adc[42][5]>120000")

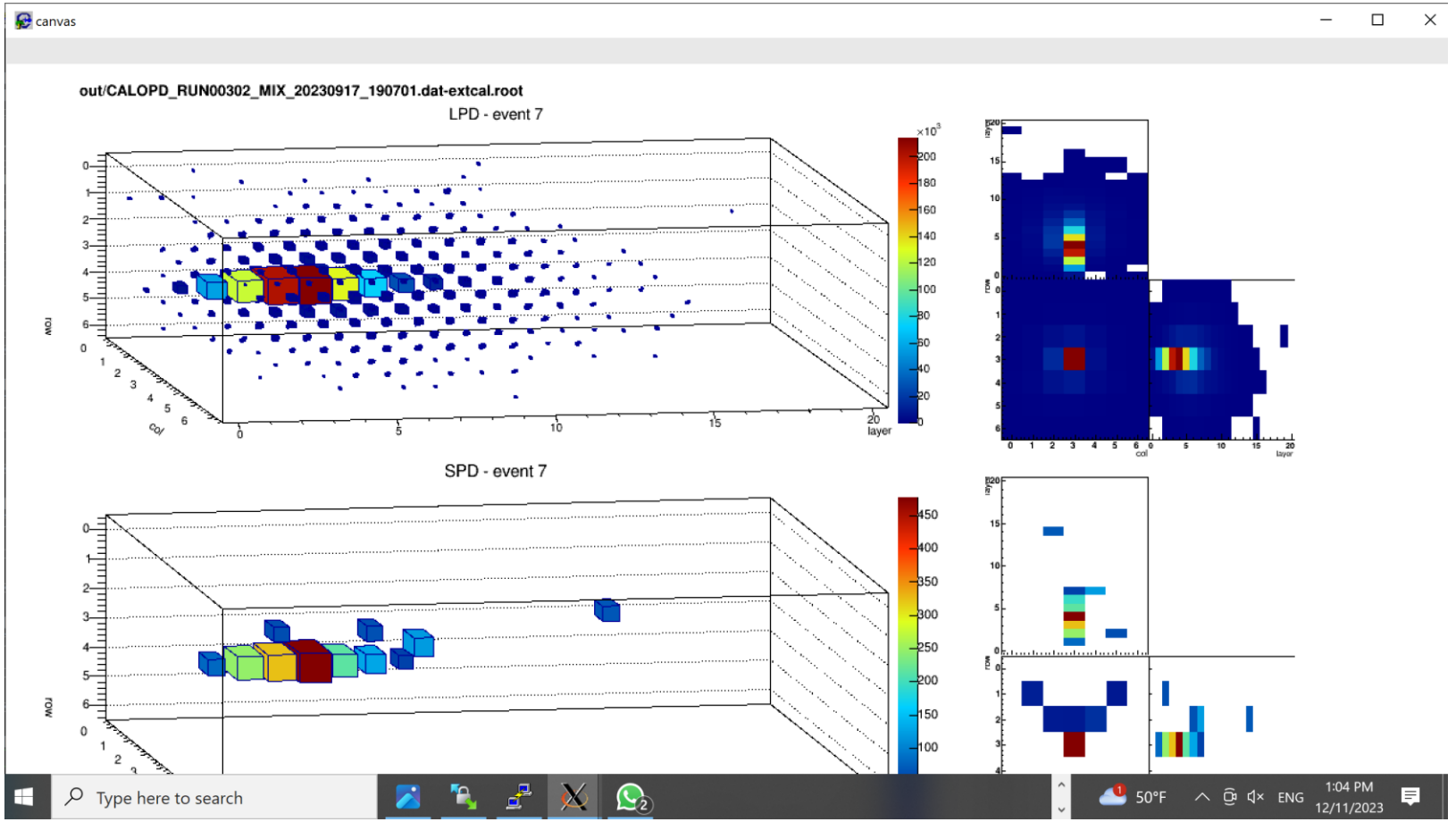
Evento buono



243 GeV

PDtree->Scan("Entry$","adc[42][5]>120000")

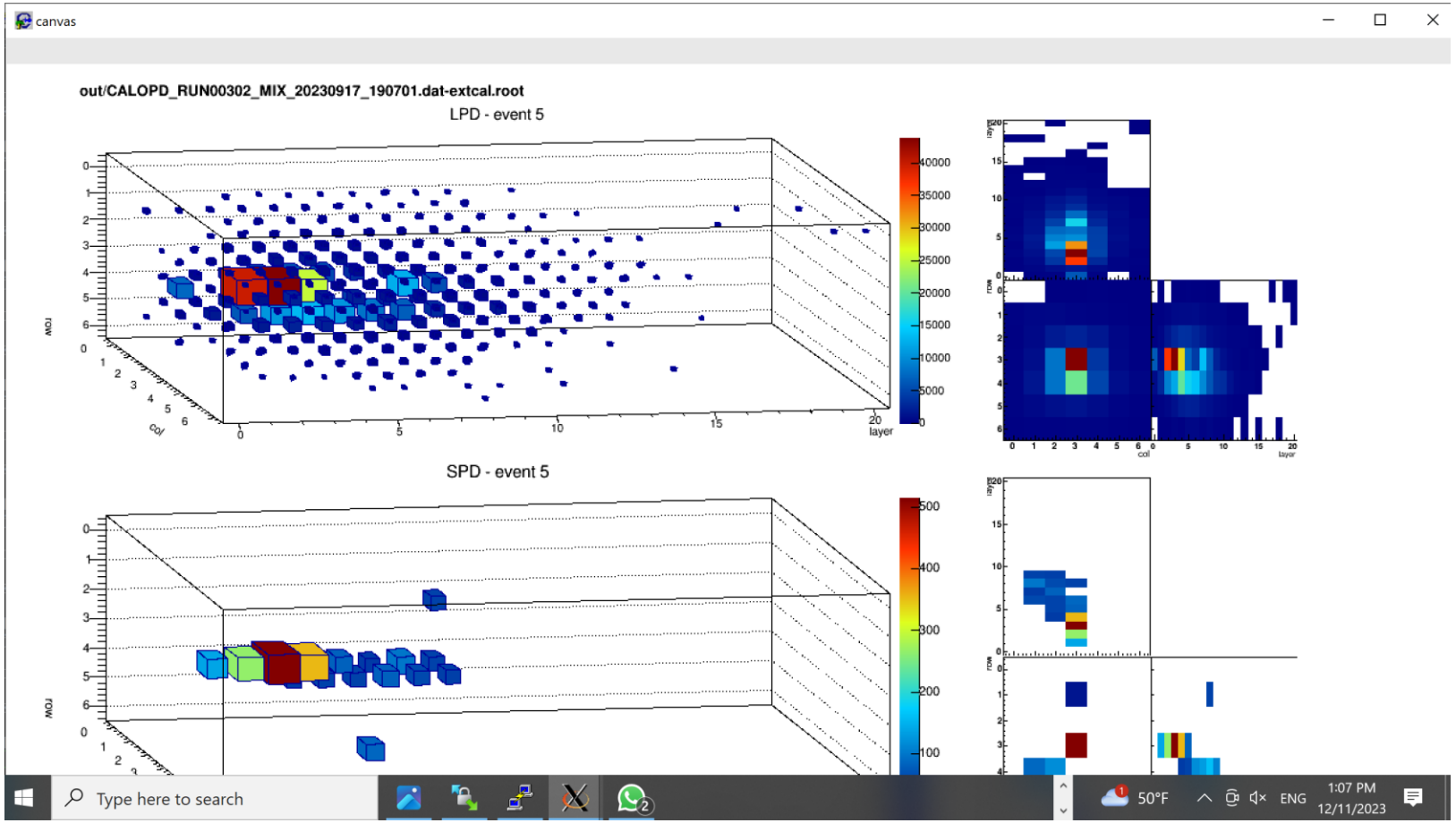
Evento buono



243 GeV

PDtree->Scan("Entry$","adc[42][5]>120000")

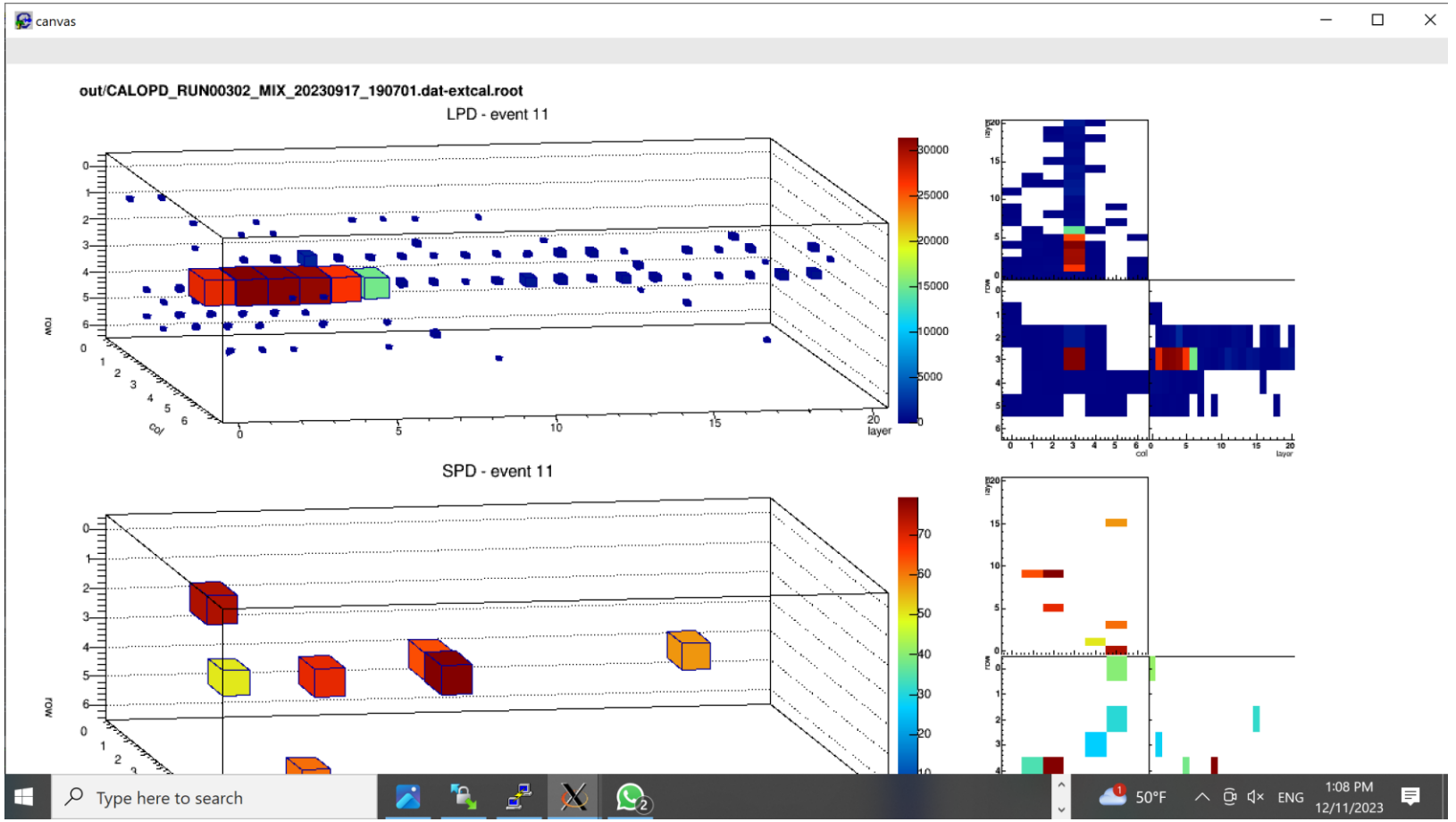
Evento cattivo



243 GeV

PDtree->Scan("Entry$","adc[42][5]>25000&&adc[42][5]<40000")

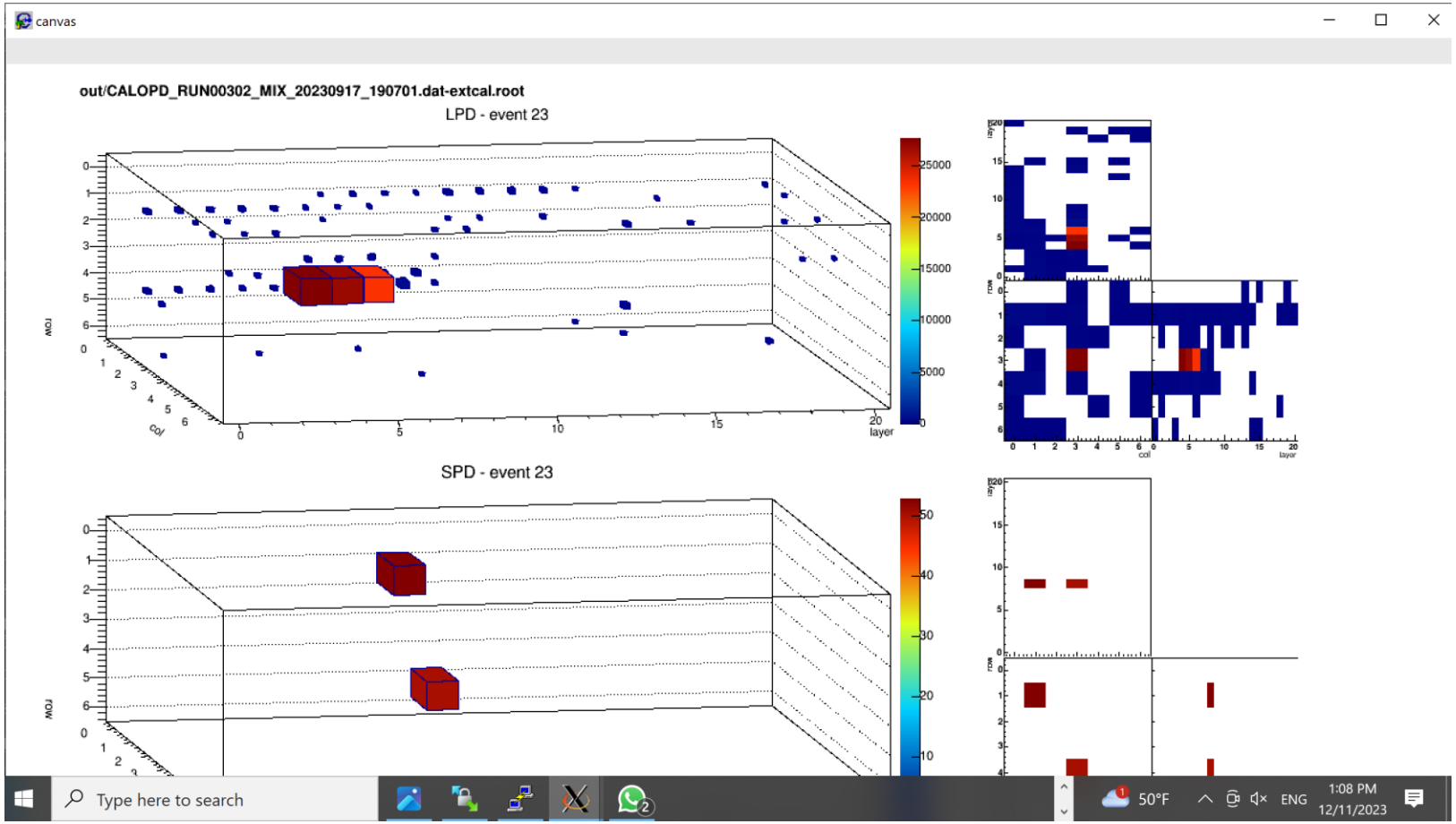
Evento cattivo



243 GeV

PDtree->Scan("Entry$","adc[42][5]>25000&&adc[42][5]<40000")

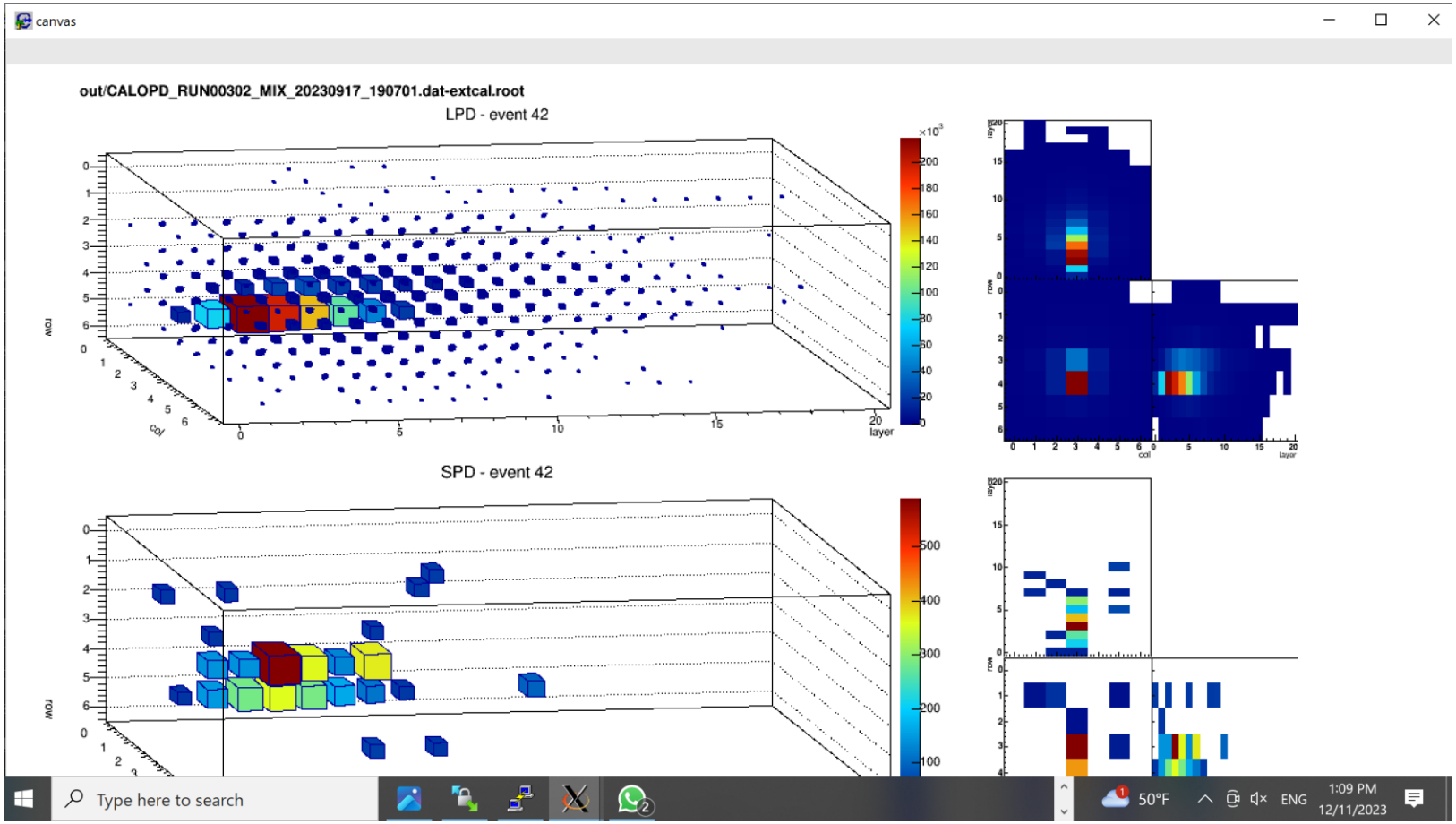
Evento cattivo



243 GeV

PDtree->Scan("Entry$","adc[42][5]>25000&&adc[42][5]<40000")

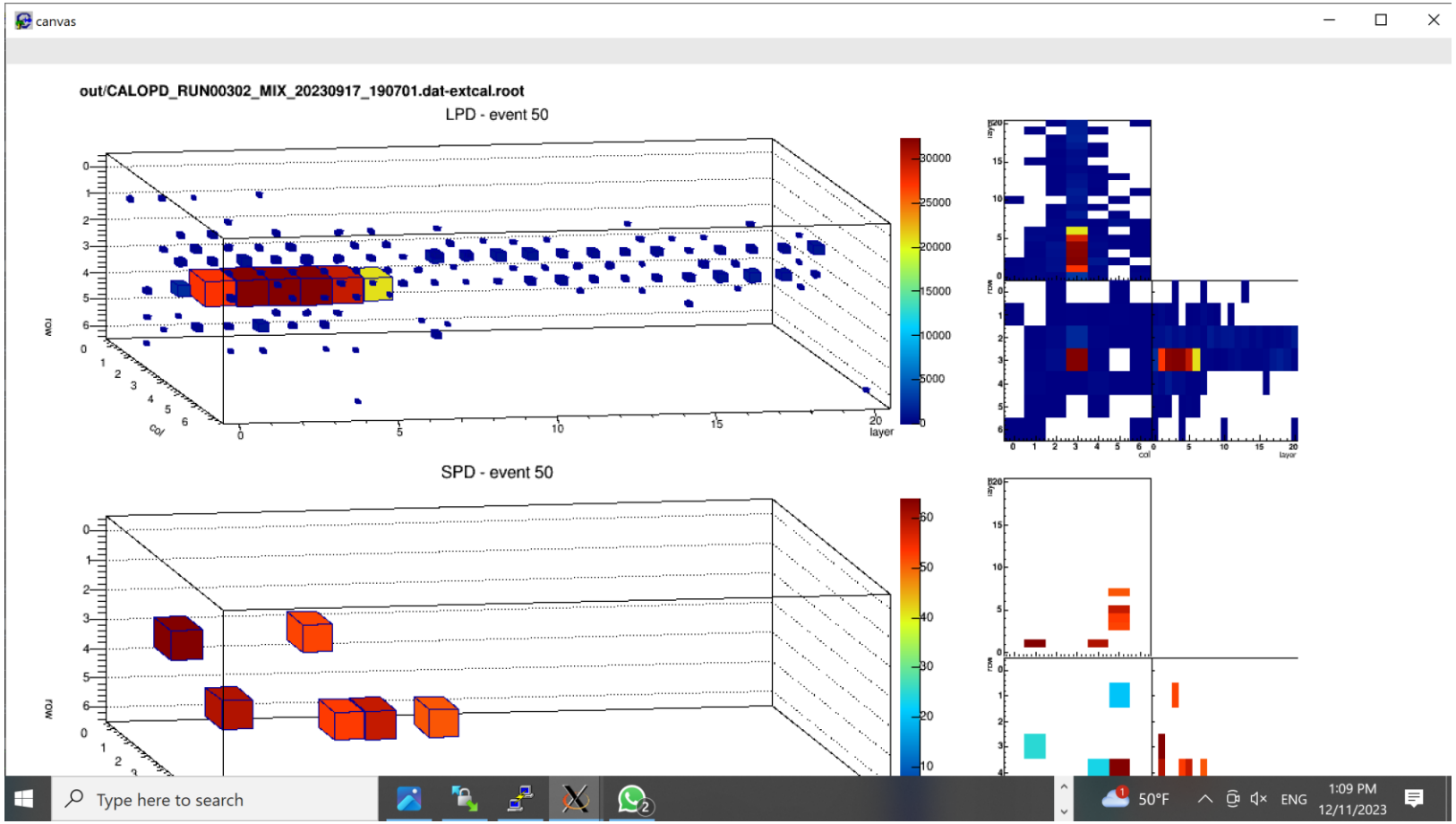
Evento cattivo



243 GeV

PDtree->Scan("Entry$","adc[42][5]>25000&&adc[42][5]<40000")

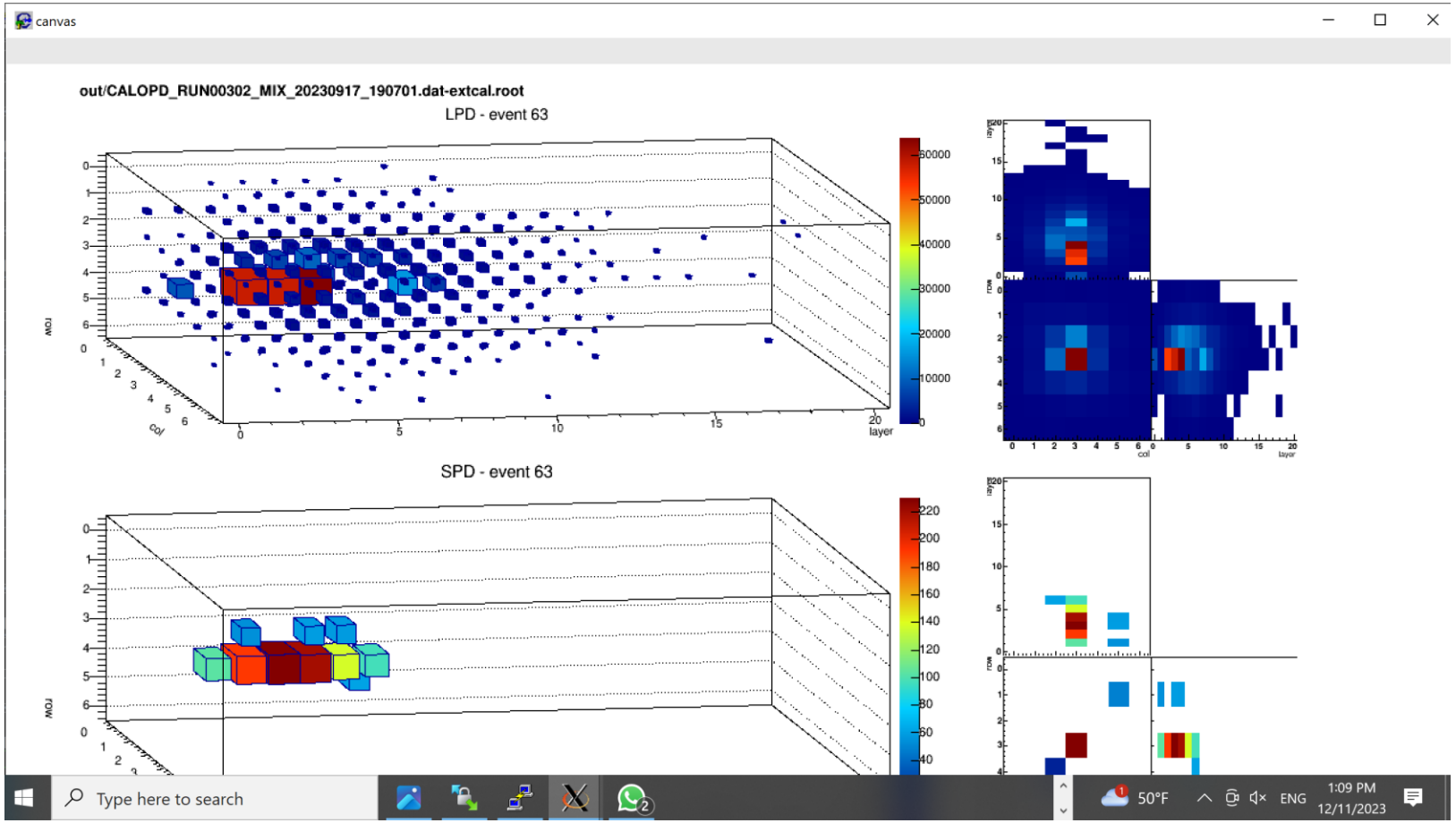
Evento cattivo



243 GeV

PDtree->Scan("Entry$","Sum$(adc[42][])<300000&&adc[42][5]>25000")

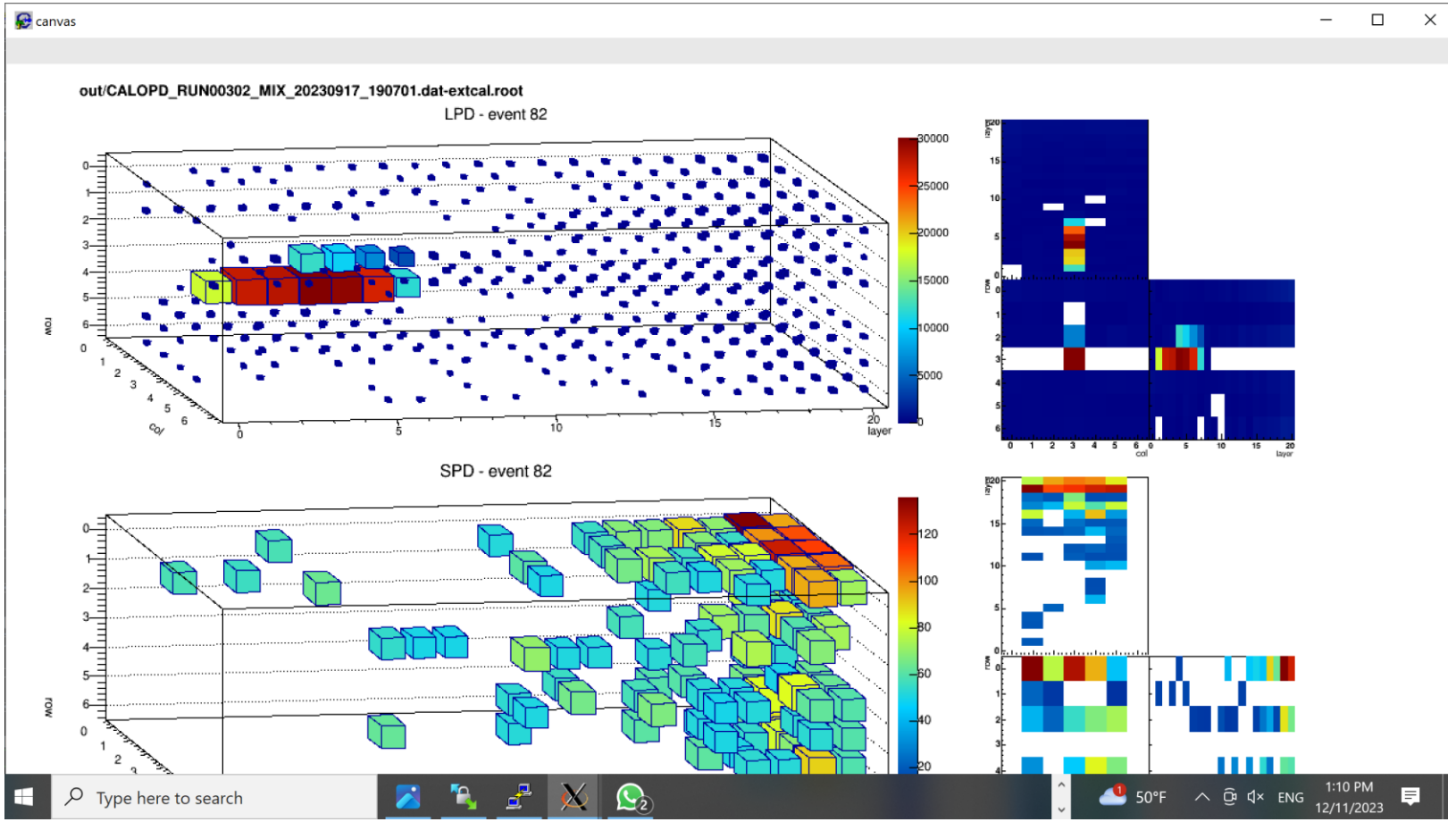
Evento cattivo



243 GeV

PDtree->Scan("Entry$","Sum$(adc[42][])<300000&&adc[42][5]>25000")

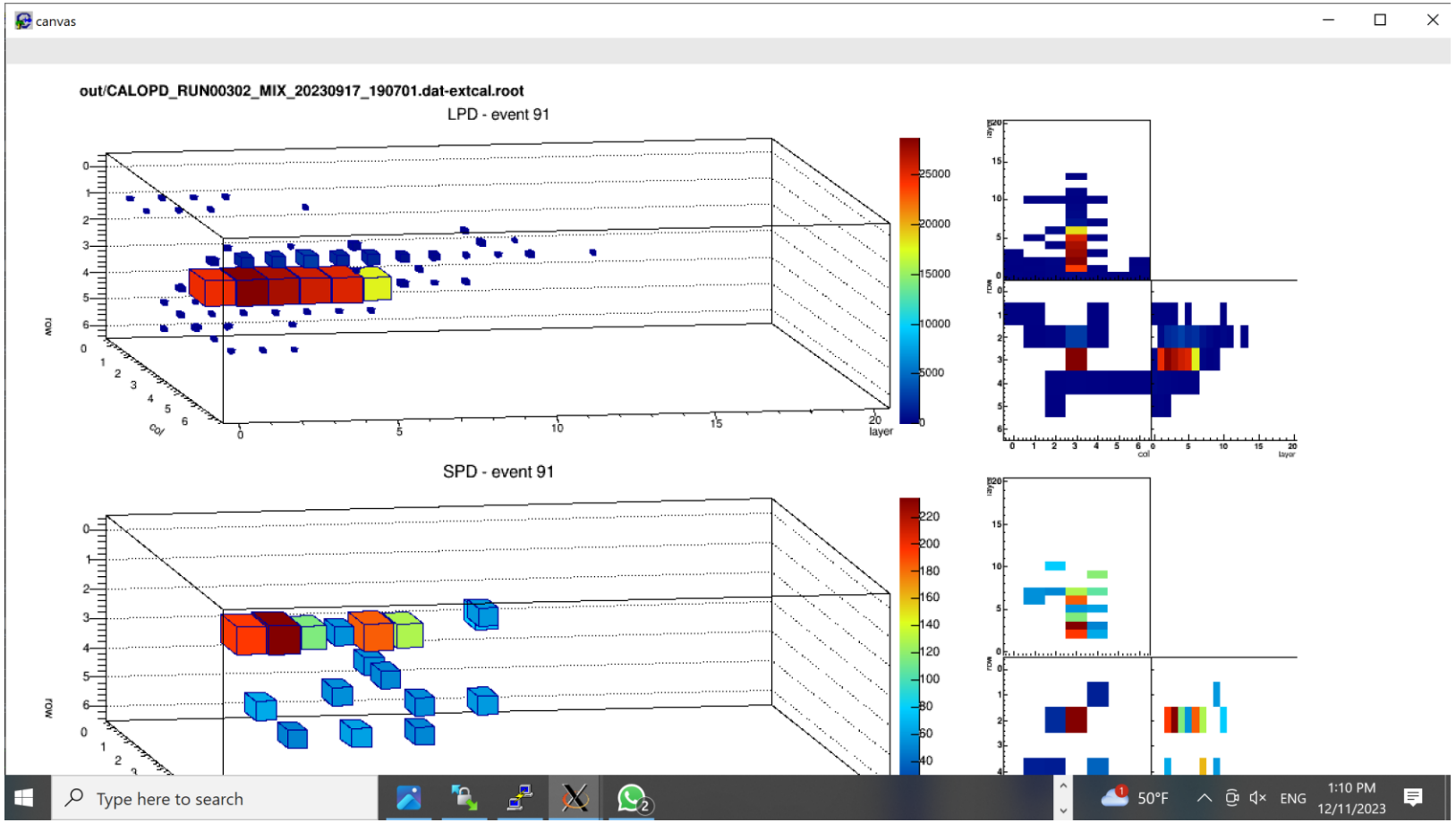
Evento cattivo



243 GeV

PDtree->Scan("Entry$","Sum$(adc[42][])<300000&&adc[42][5]>25000")

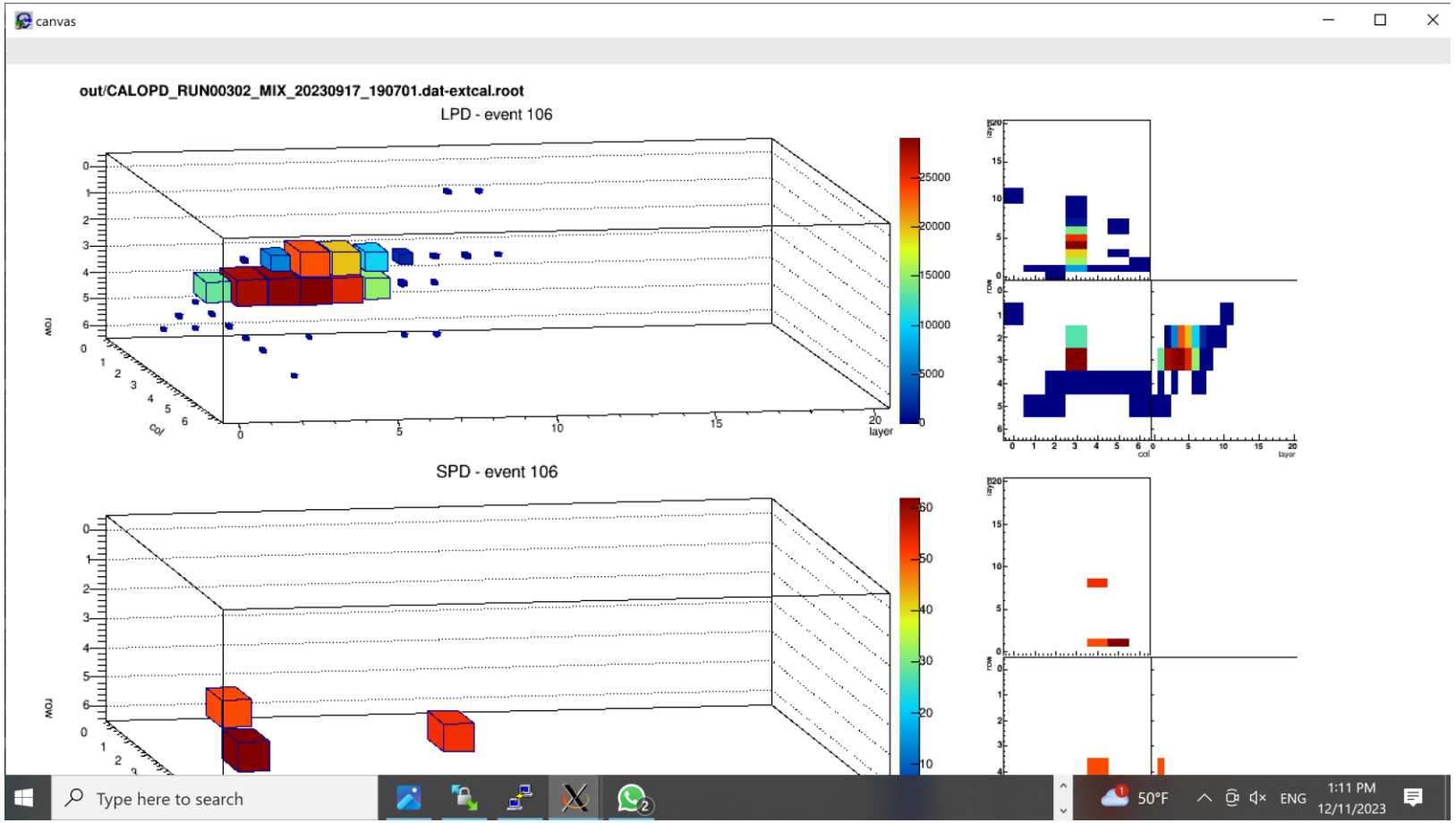
Evento cattivo



243 GeV

PDtree->Scan("Entry$","Sum$(adc[42][])<300000&&adc[42][5]>25000")

Evento cattivo



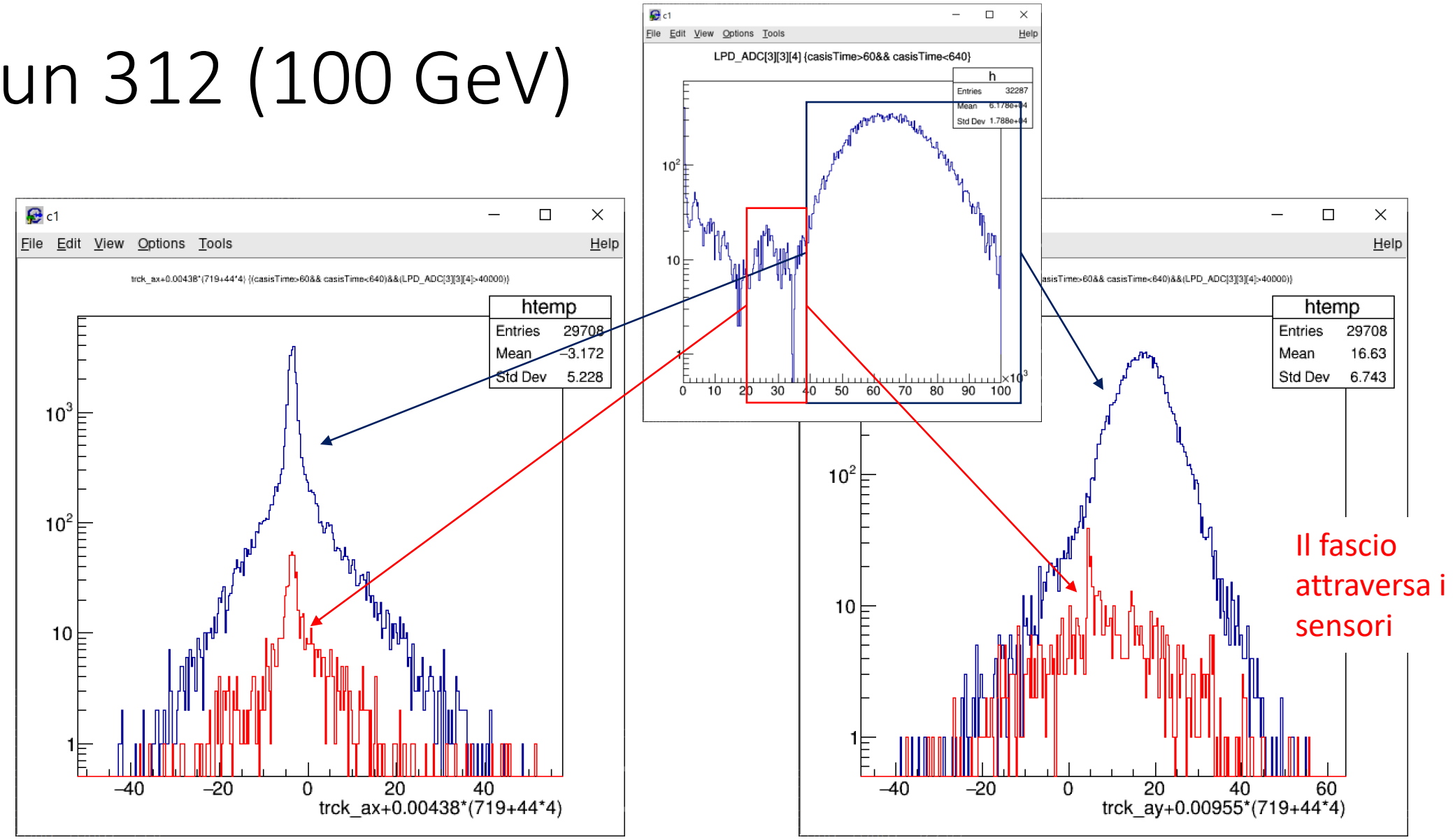
243 GeV

PDtree->Scan("Entry$","Sum$(adc[42][])<300000&&adc[42][5]>25000")

Tracciatore

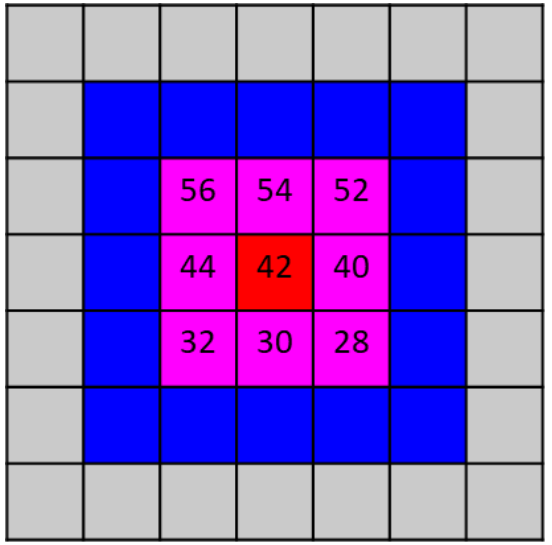
- x(z)=ax+bx*z, y(z)=ay+by*z
  - z è la distanza dal centro del SCD lungo la linea di fascio
- Run elettroni:
  - SCD-CALO faccia frontale ~ 719 mm
  - SCD-CALO ultima faccia ~ 1731 mm

Run 312 (100 GeV)



- Osservazioni emerges durante la discussion
  1. Pedestal shift
     - Guardare lo shift anche nelle colonne sopra e sotto e nel canale [42][4] (massimo dello sciame)
     - Valutare la correzione (media) per tutte le colonne 3x3
     - Fare attenzione agli spill vuoti…
  2. Sottrazione CN
     - Valutare se sottrarre il CN anche in basso Guadagno, soprattutto per le schede rumorose
  3. Comportamenti anomali al cambio di guadagno
     - Cercare alter distribuzioni a cavallo del cambio di Guadagno
     - Guardare il segnale degli LPD ciechi

layer	sensor	chip	chanel	status	CN-channel
0	0	42	0	1	12
0	1	41	0	1	4
1	0	42	1	1	12
1	1	41	1	1	4
2	0	42	2	1	12
2	1	41	3	1	4
3	0	42	4	1	12
3	1	41	5	1	4
4	0	42	5	1	12
4	1	41	6	1	4
5	0	42	6	1	12
5	1	41	7	1	4
6	0	42	7	1	12
6	1	41	8	1	4



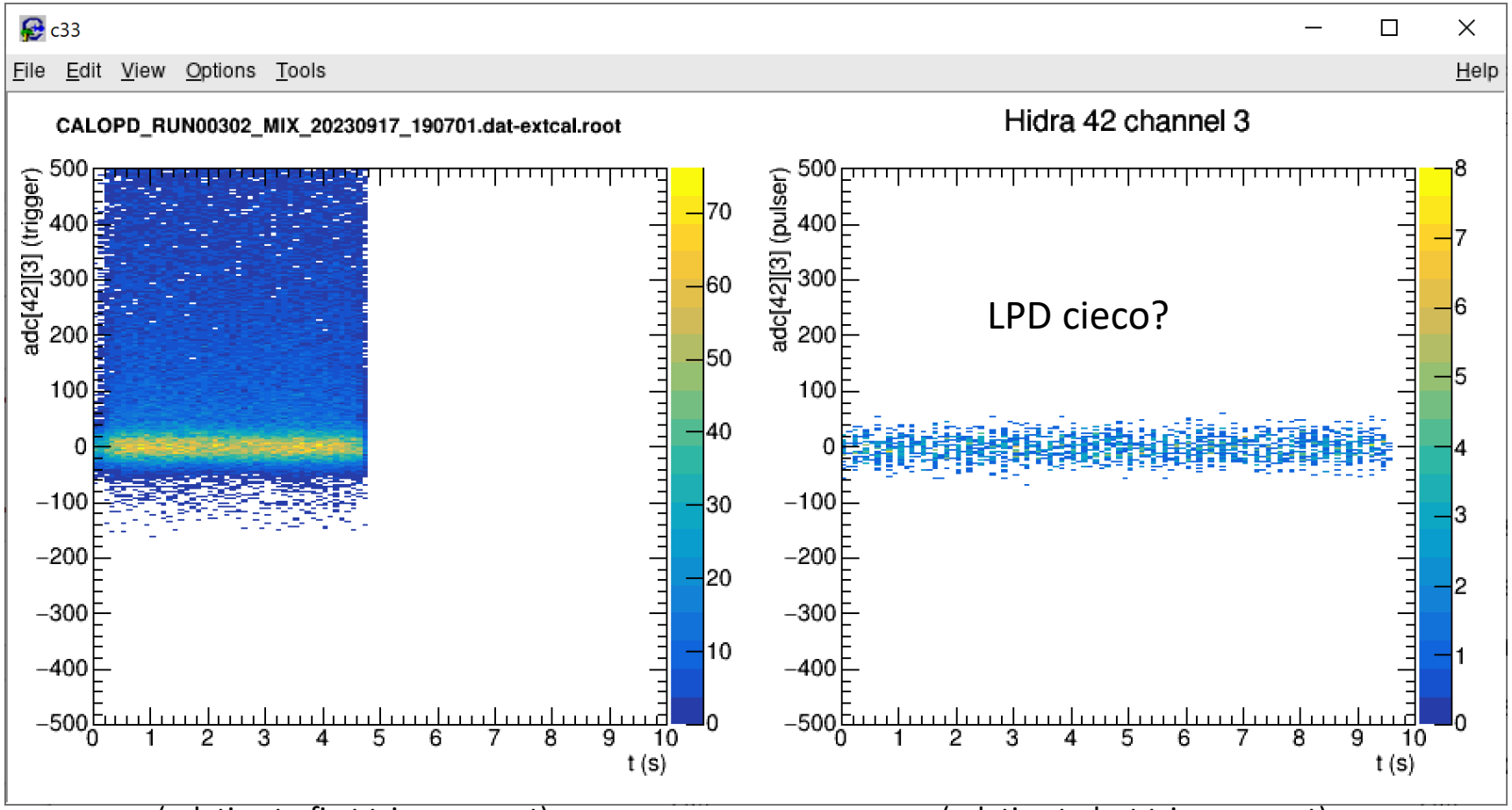

```
root [7] DumpColumn(2,3)
```

layer	sensor	chip	chanel	status	CN-channel
0	0	54	0	1	12
0	1	53	0	1	4
1	0	54	1	1	12
1	1	53	1	1	4
2	0	54	2	1	12
2	1	53	3	1	4
3	0	54	4	1	12
3	1	53	5	1	4
4	0	54	5	1	12
4	1	53	6	1	4
5	0	54	6	1	12

```
root [9] DumpColumn(4,3)
```

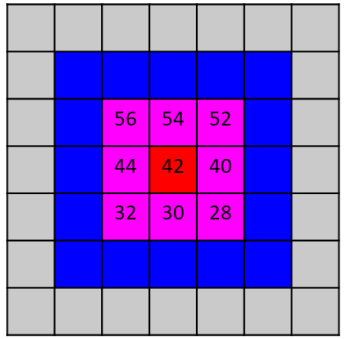
layer	sensor	chip	chanel	status	CN-channel
0	0	30	0	1	12
0	1	29	0	1	4
1	0	30	1	1	12
1	1	29	1	1	4
2	0	30	2	1	12
2	1	29	3	1	4
3	0	30	4	1	12
3	1	29	5	1	4
4	0	30	5	1	12
4	1	29	6	1	4
5	0	30	6	1	12
5	1	29	7	1	4
6	0	30	7	1	12
6	1	29	8	1	4

243 GeV

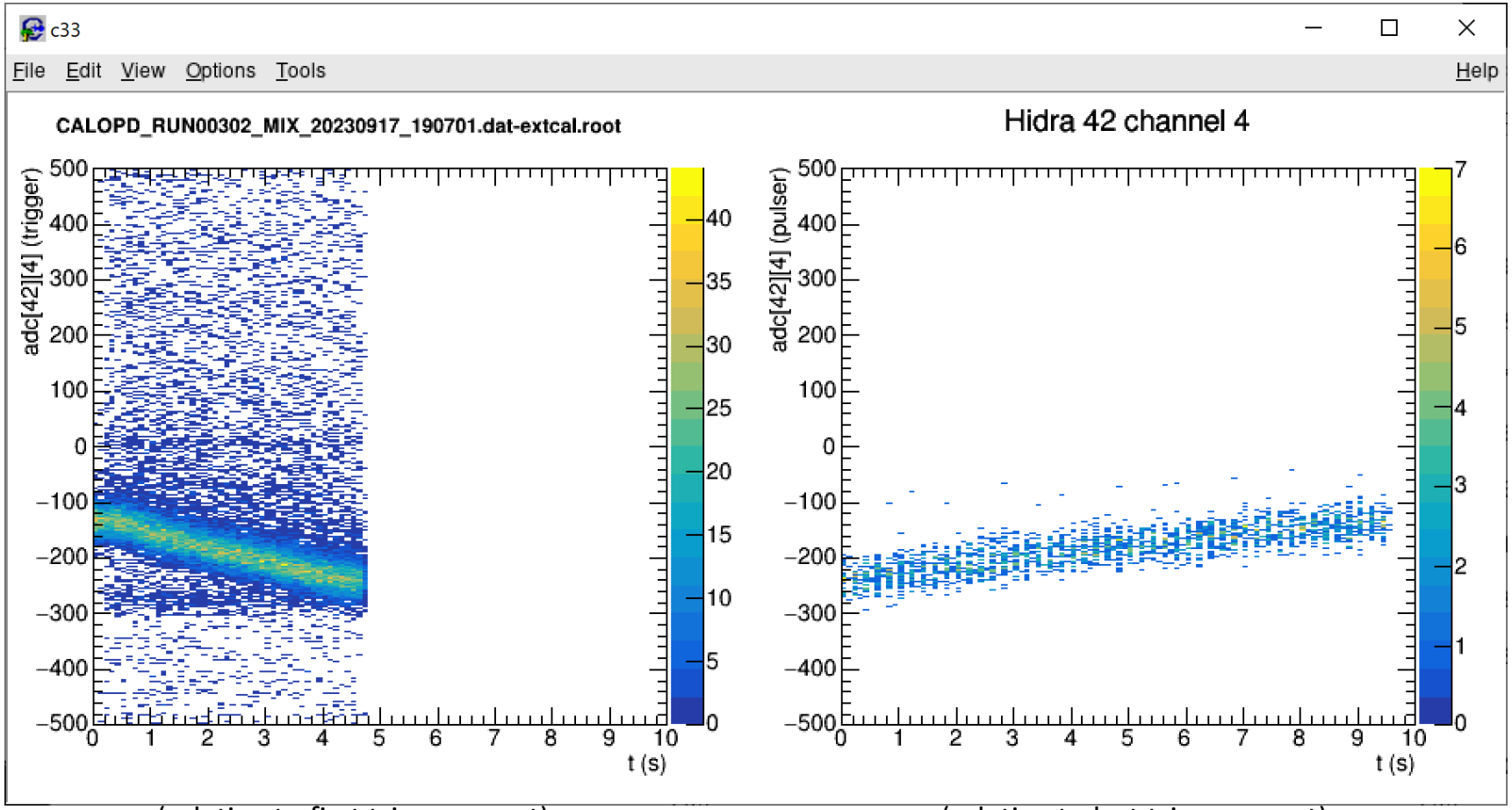


(relative to first trigger event)

(relative to last trigger event)

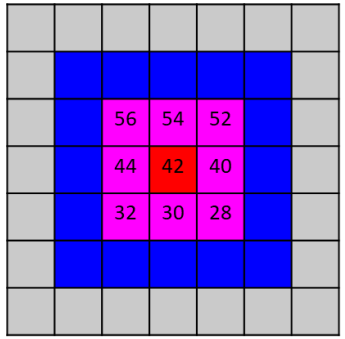


243 GeV

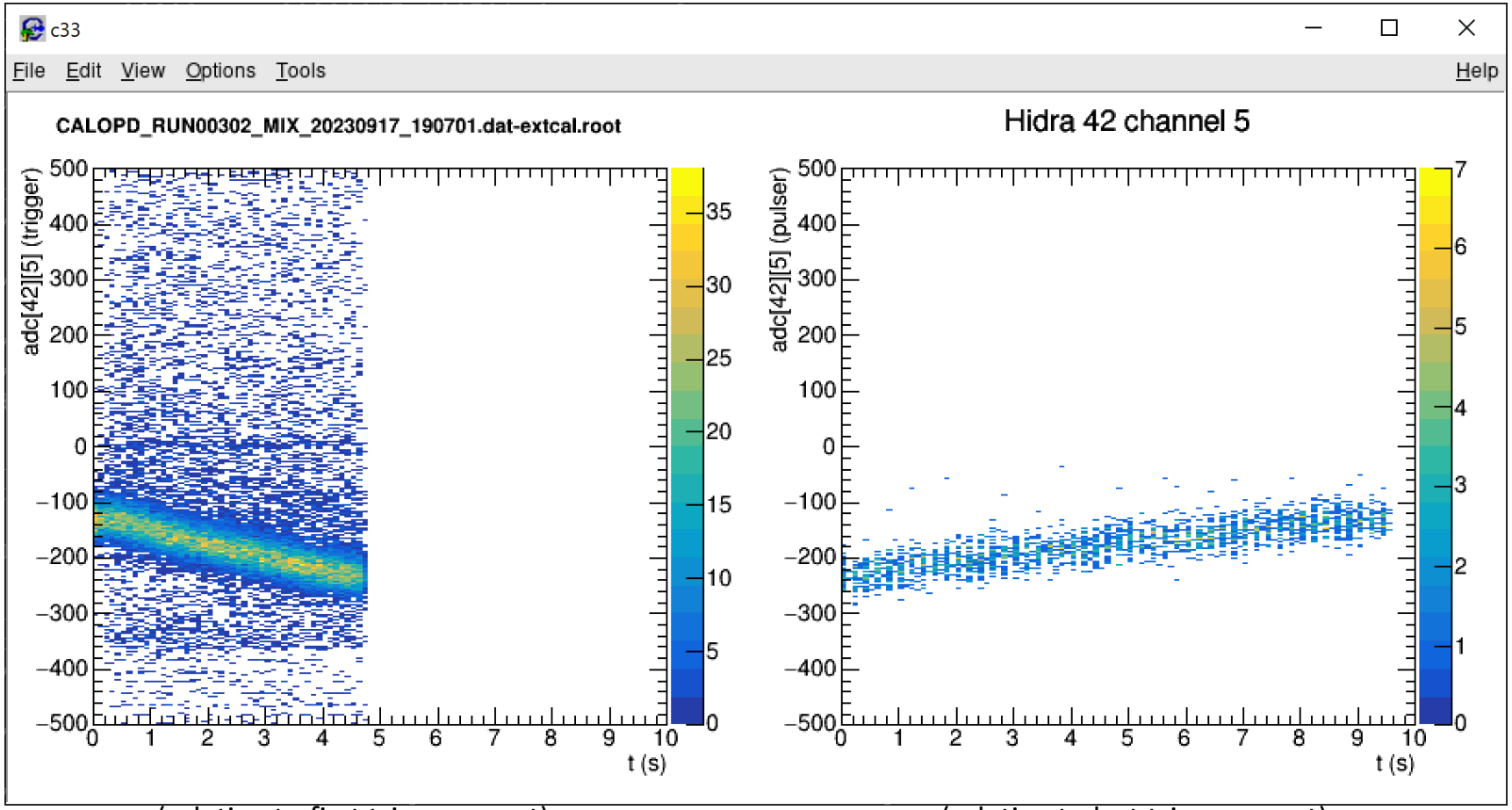


(relative to first trigger event)

(relative to last trigger event)

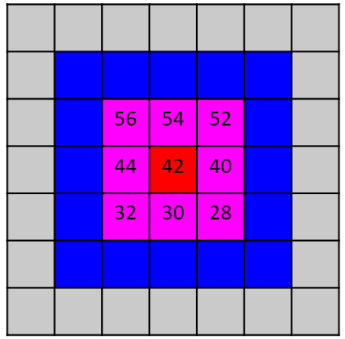


243 GeV

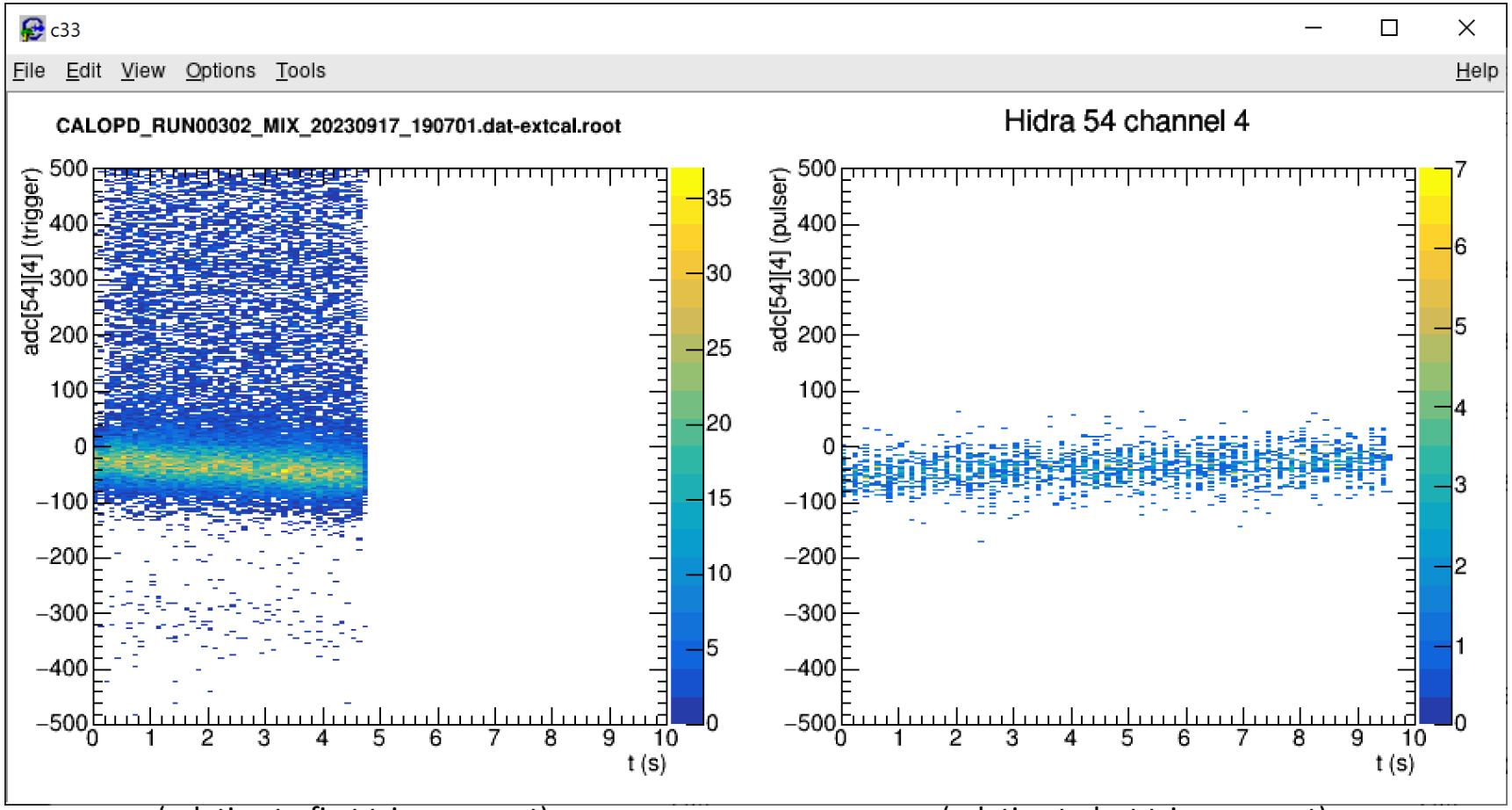


(relative to first trigger event)

(relative to last trigger event)

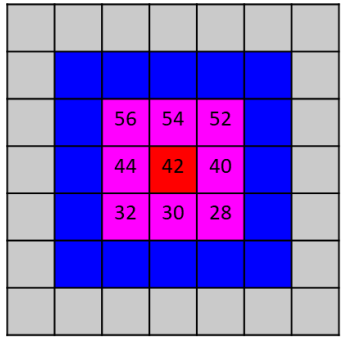


243 GeV

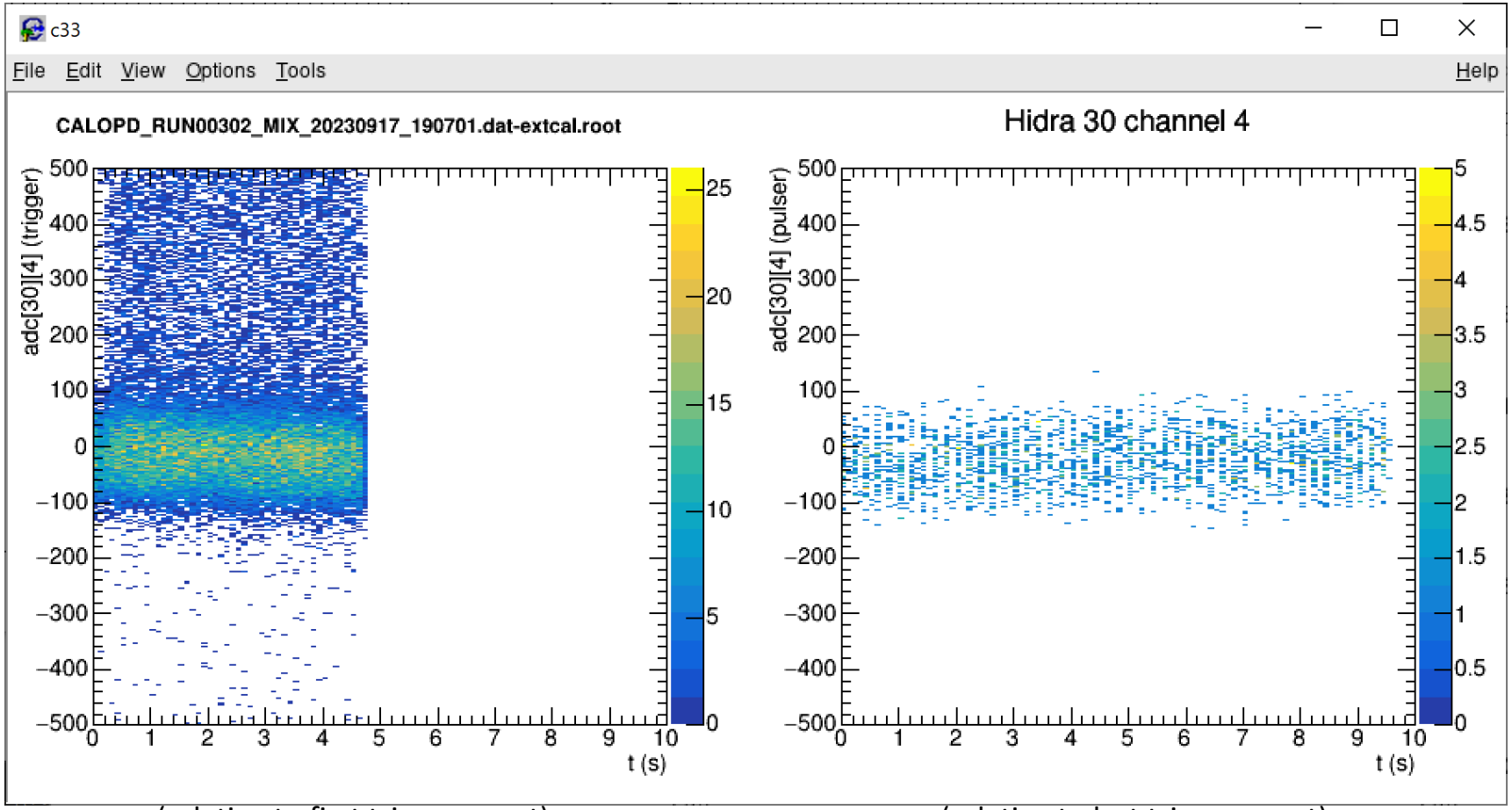


(relative to first trigger event)

(relative to last trigger event)

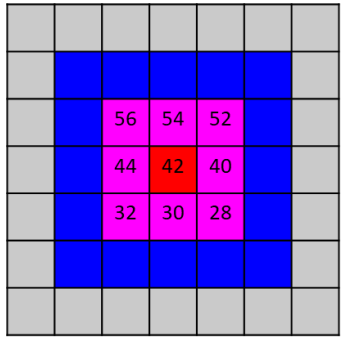


243 GeV



(relative to first trigger event)

(relative to last trigger event)



Spares